

Title: QAPP Former Bell Trading Post
Site Name: FORMER BELL TRADING POST
Site Location: Albuquerque, New Mexico

Revision Number: 002
Revision Date: 9/29/01
Page 1 of 44

**Quality Assurance Project Plan
Former Bell Trading Post
Albuquerque, New Mexico**

QTRAK

QAPP #

02-008

New Mexico Environment Department

October 1, 2001



204964

LIST OF ACRONYMS

ACBMs	Asbestos Containing Building Materials
ASHERA	Asbestos Hazards Emergency Response Act
APM	Administrative Project Manager
BGS	below ground surface
COC	Chain-of-Custody
DE&S	Duke Engineering and Services
EPA	United States Environmental Protection Agency
ESA	Environmental Site Assessment
FID	Flame Ionization Detector
FPM	Field Project Manager
GPS	Global Positioning System
GWQB	Ground Water Quality Bureau
HWB	Hazardous Waste Bureau
HEAL	Hall Environmental Analysis Laboratory, Inc.
NMAC	New Mexico Administrative Code
NMED	New Mexico Environment Department
OSHA	Occupational Safety and Health Administration
PCBs	Polychlorinated biphenyls
PID	Photoionization Detector
PM	Program Manager
PPM	parts per million
PVC	Poly vinyl chloride
QA	Quality Assurance
QAPP	Quality Assurance Project Plan
QC	Quality Control
SOP	Standard Operating Procedure
TPH	Total Petroleum Hydrocarbons
USTs	Underground storage tanks
UV	Ultraviolet
USCS	Unified Soil Classification System
VOCs	Volatile Organic Compounds
VRP	Voluntary Remediation Program
WQCC	Water Quality Control Commission

Former Bell Trading Post Quality Assurance Project Plan

TABLE OF CONTENTS

FORMS

Project Management

Form A	Title and Approval Page
Form B	Project Organization and Responsibility
Form C	Problem Definition
Form D	Project Description/Project Timeline

Measurement Data Acquisition

Form E	Sampling Design
Form F-1	Method and SOP Reference Table
Form F-2	Sampling and Analytical Methods Requirements
Form G	Preventive Maintenance - Field Equipment
Form H	Calibration and Corrective Action - Laboratory Equipment
Form I	Preventive Maintenance - Laboratory Equipment
Form J	Calibration and Corrective Action - Laboratory Equipment
Form K	Sample Handling and Custody Requirements
Form L	Analytical Precision and Accuracy
Form M	Field Quality Control Requirements/Laboratory Quality Control Requirements
Form N	Data Management and Documentation

Assessment/Oversight

Form O	Assessment and Response Actions
Form P	Project Reports

Data Validation and Usability

Form Q	Data Verification and Validation
Form R	Data Usability

Title: QAPP Former Bell Trading Post
Site Name: FORMER BELL TRADING POST
Site Location: Albuquerque, New Mexico

Revision Number: 002
Revision Date: 9/29/01
Page 4 of 44

Form A

Title and Approval Page

Quality Assurance Project Plan

Document Title

New Mexico Environment Department

Prepared by: (New Mexico Environment Department)

GROUND WATER QUALITY Bureau1190 St. Francis Dr. SANTA FE, NM 87505

Address and Telephone Number

505-827-275410-3-01

Day/Month/Year

Project Manager:

Christine D. Bynum

Signature

CHRISTINE D. BYNUM 10-3-01

Printed Name/Date

Project QA Officer:

C.D. Bynum for Bart Faris

Signature

BART FARIS 10-3-01

Printed Name/Date

U.S. EPA Project Manager Approval:

Dorothy Crawford

Signature

Dorothy Crawford 10/3/01

Printed Name/Date

Title: QAPP Former Bell Trading Post
Site Name: FORMER BELL TRADING POST
Site Location: Albuquerque, New Mexico

Revision Number: 002
Revision Date: 9/29/01
Page 4 of 44

Form A

Title and Approval Page

Quality Assurance Project Plan

Document Title

Prepared by: (New Mexico Environment Department)

Address and Telephone Number

Day/Month/Year

Project Manager: _____
Signature

Printed Name/Date

Project QA Officer: _____
Signature

Printed Name/Date

U.S. EPA Project Manager Approval: _____
Signature

Printed Name/Date

Form B

Project Organization and Responsibility

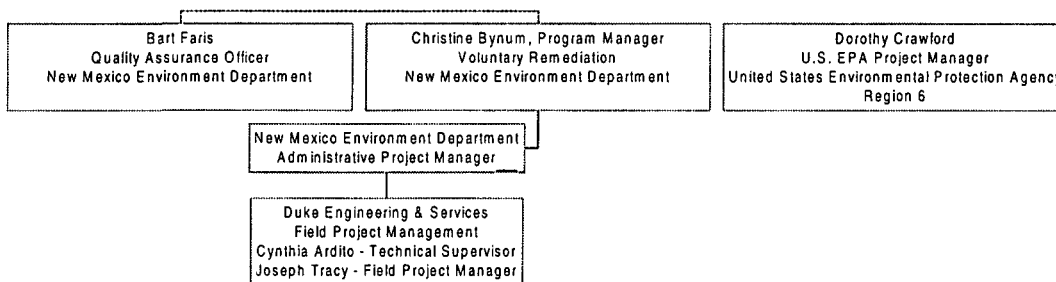


Figure 1 Project Organizational Chart

Project Organization

The Quality System for the New Mexico Environment Department (NMED) Ground Water Quality Bureau (GWQB) includes two levels of management control: the Organizational Level and the Technical/Project Level. The Organizational Level includes all activities that support common or standardized functions. The Technical/Project Level consists of project-specific activities required to produce a quality product. Each individual in the GWQB is responsible for reviewing and following the appropriate Quality Assurance/Quality Control (QA/QC) procedures during all GWQB activities. The Program Manager (PM), QA Officer, and Technical Supervisors are responsible for overseeing the QA procedures employed by the staff.

Project Personnel

The following project personnel have been assigned to the positions listed above (Figure 1).

Program Manager:

The PM is the principal decision maker and is the person responsible for accepting final products and deliverables. The PM coordinates the overall management of each Brownfields project. Responsibilities include:

- 1) Communicating United States Environmental Protection Agency (EPA) and NMED policy to Project staff; ensuring Project activities are consistent with goals and objectives of EPA's and the State's program requirements;
- 2) Coordinating with Bureau Chief on NMED management, other NMED programs, and on Site-specific and policy issues;

- 3) Managing costs, schedules, and performance;
- 4) Ensuring the establishment, implementation, and support of QA and Health and Safety Programs; and
- 5) Performing personnel actions.

Quality Assurance Officer:

Responsibilities include:

- 1) Serving as a contact for all QA matters internally and externally;
- 2) Interacting with the PM to resolve quality concerns;
- 3) Verifying that personnel are qualified to conduct assigned work; and
- 4) Assisting the PM in development of Work Plan.

Administrative Project Manager:

The Administrative Project Managers (APMs) are the principal data users. Responsibilities include:

- 1) Oversight of contractors, as appropriate,
- 2) Compliance with Quality Assurance Project Plan (QAPP);
- 3) Preparation of Work Plans, Safety Plans and Technical Reports;
- 4) Assessment of project data quality; and
- 5) Maintenance of field, laboratory, and computer equipment.

The NMED APM of the Site is responsible for oversight of project administration, including QA/QC. The APM is responsible for implementing this QA plan. The APM, or their designated representative, will be on Site during each phase of field data collection activities, as appropriate and necessary.

Technical Supervisor:

Responsibilities include:

- 1) Overseeing day-to-day operations including planning, scheduling, and reporting of technically related activities;
- 2) Coordinating Site-specific issues with NMED; and
- 3) Reviewing all documents prior to submittal to NMED.

Field Activities Organization:

The Field Project Manager (FPM) is responsible for the coordination of all personnel on Site and the overall project management of the field activities. The FPM will be a representative of Duke Engineering & Services (DE&S) for the Bell Trading Post project. The FPM will coordinate all on-Site activities and will be present during field investigations. The on-Site team will consist of the FPM and designated personnel who will perform tasks such as collecting samples. The FPM will appoint another staff member to assume responsibility in the event the FPM cannot travel to the Site. The FPM will maintain the field book. The

Title: QAPP Former Bell Trading Post
Site Name: FORMER BELL TRADING POST
Site Location: Albuquerque, New Mexico

Revision Number: 002
Revision Date: 9/29/01
Page 7 of 44

FPM is responsible for adherence to all QA/QC guidelines as defined in the QAPP. All staff in the field will have had Occupational Safety and Health Administration (OSHA) 40-hour training (HAZWOPER 29 CFR 1910.120) and be current with their annual 8-hour OSHA refreshers. All staff will have knowledge of the protocols for State-contracted laboratories pertaining to sample collection, preservation, labeling, and maintenance of chain-of-custody (COC) documentation.

Form C

Problem Definition

Site History, Location and Background

The Former Bell Trading Post property is located at 1503 Central Avenue NW near Old Town Albuquerque. The Site includes approximately 2.5 acres and is bounded by Central Avenue on the south, Roma Avenue on the north and northeast, Fifteenth Street on the northwest, an apartment building and vacant business on the east, and by Laguna Avenue on the west. Currently there is one large building (approximately 30,000 square feet [ft²]) on the Site.

The Site was originally developed as a residential property prior to 1946. In 1947, the Bell Trading Post was constructed. It operated from 1947 to 1975 manufacturing silver jewelry. The Site was vacant from 1976 to 1980. From about 1982 to 1984, Albuquerque Photo Lab occupied the Site. This business performed commercial film development. Since 1985, the building has been used for office space and no manufacturing or industrial activity has occurred at the Site. In recent years, the building has been vacant.

The City of Albuquerque is in the process of purchasing this Site. Because of its location on Central Avenue near Old Town, the City plans to potentially redevelop the Site as housing.

Environmental and Human Health Concerns/Previous Environmental Studies

Based on limited background research of the jewelry manufacturing industry and current jewelry industry practices, the following chemicals are likely to be present at a jewelry manufacturing facility: sodium and/or potassium cyanide, hydrogen peroxide, sulfuric and boric acids, ammonia hydroxide, calcium sulfate, sulfured potash, potassium bifluoride (and potassium tetraborate), and heavy metals such as gold, silver, and copper.

Chemicals used in the development of black and white photographic films are: silver halide (contained in emulsifiers); hydroquinone, metol, and phenidone (used as developing agents); sodium hydroxide, sodium carbonate, and sodium tetraborate (applied to activate development); sodium sulfite and potassium metabisulfite (used as preservatives), potassium bromide and benzotriazole (restrainers); acetic acid; sodium or ammonium thiosulfate (used to fix development); sodium bisulfite and potassium metabisulfite (employed as neutralizers); and potassium aluminum sulfate and potassium chromium sulfate (applied as hardeners). Chemicals used in the color photographic processes are: potassium ferricyanide and potassium bromide, ethylenediamine tetraacetic acid (EDTA), bleach, hexavalent chromium, and organic dyes.

Most of the chemicals listed in the previous paragraph are not included on the New Mexico Water Quality Control Commission (WQCC) list of toxic pollutants (20.6.2.7.UU NMAC), nor are there New Mexico WQCC Ground Water Standards (20.6.2..3103 NMAC) for most of the chemicals listed in the previous paragraph. However, New Mexico ground water standards do

exist for some of the chemicals listed in the previous paragraph, as well as for their breakdown products.

Previous work performed at the Site includes a Phase II Environmental Site Assessment completed in 1994. This study is reported in the document entitled, "Limited Subsurface Investigation at 1503 Central Avenue, Albuquerque, New Mexico," (Keers, April 1994). DE&S has summarized the findings and conclusions in the current Work Plan, as follows:

- Ten surficial soil samples were collected in a crawl space beneath the building. The samples had been collected at suspected highly contaminated areas under drains, sumps, and piping. The samples were analyzed for volatile organic compounds (VOCs) and halogenated hydrocarbons using laboratory method SW-846 8010, total cyanide using laboratory method SW-846 9010, and RCRA metals using laboratory method SW-846 AA.
- Results from the limited subsurface investigation revealed that silver, chromium, and lead were present in several surficial soil samples collected from within the crawl space under the building. Two of the subsurface soil samples collected contained metals with concentrations exceeding the Toxicity Characteristic Leaching Procedure (TCLP) regulatory limit. One subsurface soil sample contained 134 parts per million (ppm) lead, and the other subsurface soil sample contained 174 ppm chromium and 1,670 ppm lead. The elevated concentrations of these compounds prompted further field investigation and the collection of soil samples from a depth of 5 feet below the soil surface at each of the two locations where elevated metal concentrations were detected in the initial investigation. These deeper subsurface soil samples were analyzed using TCLP methods for the specific metal that was originally detected. Silver concentrations of <0.010 ppm were reported in samples from below locations where initial samples reported elevated silver concentrations. The sample collected below the location where chromium and lead had been detected contained 0.047 ppm chromium and 0.890 ppm lead. Keers indicated that the results from the five-foot deep samples were well below the EPA regulatory limits and that additional testing was not recommended at that time (Keers 1994).

The fact that heavy metals were detected in samples from beneath the building crawlspace indicates that metals are chemicals of concern for the Site. Because the COA may elect to use this property for housing, metals in soil at the Site are of concern. The current Phase II work at the Former Bell Trading Post property has been designed to sample surface soils that are and/or were exposed around the Site to ensure that these soils have not been impacted by metals. These shallow soil samples will be collected with a Geoprobe®. In addition, the Phase II Work Plan proposes to complete four Geoprobe® soil borings to ground water at upgradient and downgradient locations to determine if there is a "fingerprint" of impact to ground water at this Site. A suite of analytes has been selected for the groundwater samples that provide indicators of leaching for the types of organic and inorganic chemicals potentially used at the Site, as well as the various heavy metals that were used at the Site.

There is a known leaking underground storage tank (UST) site located upgradient of the Bell Trading Post property. That Site is known as the World Motel UST. Based upon information obtained from the NMED UST Bureau, it appears that the ground water plume from the World

Motel UST has been delineated and it does not extend as far as the Bell Trading Post property. Based upon this information, NMED is not planning to sample soil and subsurface soil and ground water for VOCs at the Bell Trading Post Site. If evidence of petroleum hydrocarbon contamination is observed in subsurface soils, then samples of soil and ground water will be collected at upgradient and downgradient locations for VOCs and total petroleum hydrocarbons (TPH).

Potential Migration Routes and Media

Media of concern at the Site include surface soils, subsurface soils and to a lesser extent, ground water. Potential transport pathways at the Site include primarily leaching of metals from soil to ground water. If it is determined that exposed surface soils are contaminated with metals, then potential transport pathways include surface erosion and transport of soils, as well as potential direct exposure of Site residents, workers, or visitors to contaminated soil.

The Site is located in the Albuquerque Basin. The Albuquerque Basin is filled with up to 10,000-feet of clastic sediments, of which most are designated the Santa Fe Formation. The Santa Fe Formation is composed of unconsolidated to loosely consolidated gravels, sands, silts, and clays, that reach considerable thickness. The Santa Fe Group and post-Santa Fe deposits are the principal water bearing units in the vicinity of the Site and are hydraulically connected (USACE 1979; Thorn et al. 1993). As a result of spatial variations in lithology, variation in the hydraulic transmissivity of the Albuquerque aquifer is extremely large, from less than 10 ft²/day to 80,000 ft²/day (Thorn et al. 1993). The hydraulic conductivity of the upper part of the Santa Fe Group varies also, but is estimated to be approximately 20 ft/day, average in the vicinity of the Site (Thorn et al., 1993). Depth to ground water in the vicinity of the Site is thought to be approximately 25-feet below ground surface (bgs).

Over time, increased water pumpage and use have considerably changed the water table configuration in the Albuquerque area. Groundwater flow in the vicinity of the Site prior to large-scale groundwater development is thought to have been to the southwest, and this condition existed at least into the mid- to late-1930s (Thorn et al. 1993). Groundwater elevation contours representing 1960–1961 conditions in the Albuquerque area show a continued general southwesterly flow direction on the eastern side of the Rio Grande; however, a cone of depression is evident in the general area of the Site (Bjorklund 1961). The cone of depression resulted primarily from pumping of the Main Plant well field, previously located in the downtown Albuquerque area. The Main Plant wells were drilled between 1920 and 1948 and consisted of more than 23 wells; the Main Plant well field is now completely abandoned.

Groundwater beneath the Site currently flows in an easterly direction. City-wide groundwater contours from 1992, and simulated 1994 hydraulic head levels, reflect a large cone of depression developing on the eastern side of Albuquerque as a result of groundwater withdrawal (Kernodle et al. 1995). Based on the Kernodle Study, this cone of depression appears to have influenced the groundwater flow direction beneath the Site.

Form D

Project Description

The purpose of this Phase II investigation is to acquire sufficient information to complete the initial characterization of the Former Bell Trading Post Site. These data will be used to meet NMED VRP closure requirements and to determine if any Site remediation is necessary. Soil characterization is planned in areas of the Site with exposed soil. No additional data collection is planned in the area beneath the building crawl space that has previously been sampled. Grab samples of upgradient and downgradient ground water will be collected from four of the Geoprobe® soil borings. These groundwater samples will be submitted for laboratory analysis. These results will be used to compare upgradient and downgradient water quality and determine if the Site is impacting ground water quality.

Soil samples will be collected from the upper 4 feet of the soil column at a minimum of eight Geoprobe® soil boring locations using a Geoprobe® macro-sampler. Discrete soil samples will be collected from the 0 to 2-feet interval and the 2- to 4-feet interval. All of the shallow soil samples (the 0 to 2-feet bgs interval) collected from each soil boring will be submitted for laboratory analysis. If metals are detected in any of these soil samples (0 to 2-feet bgs intervals) above normal background levels, then the associated deeper soil sample (the 2- to 4-feet interval) from the same soil boring will be analyzed by the laboratory in order to assess the potential for leaching at the Site. These two sets of samples will provide a point of comparison to determine leaching potential if elevated levels of metals are identified in the shallower samples.

Soil samples will be sent to Hall Environmental Analytical Laboratory, Inc. (HEAL) in Albuquerque, New Mexico for analysis of metals, cyanide, and pH. Ground water samples will also be sent to HEAL and will be analyzed for metals, cyanide, pH, anions-cations, fluoride, nitrate, and other water quality parameters as shown on Form F-2.

The project deliverable is a final report that will describe the work performed, summarize detected analytes, illustrate locations of soil samples and borings, provide laboratory analytical data, describe results compared to the results of previous sampling, and provide recommendations for additional work, if needed.

Form E

Sampling Data Design

Sampling Methodology

The following types of field activities will be performed during this project:

- Field inspection and description of soil samples;
- Surface soil sample collection and analysis;
- Soil boring and subsurface soil sample collection and analysis; and
- Collection of ground water samples from Geoprobe® soil borings.

The sampling and analysis section of this Work Plan includes the following activities:

- Soil sample collection and analysis;
- Groundwater sample collection and analysis.

Soil Boring Installation and Continuous Soil Sampling

DE&S will advance 12 Geoprobe® soil borings at the approximate locations shown on Figure 2 of the Phase II Site Characterization Work Plan. These locations will be selected from a sampling grid that covers all open areas (not covered by the Site building):

- Two (2) near the northeastern corner of the Site (adjacent to the gravel alley);
- One (1) near the northwestern corner of the Site (adjacent to the intersection of Roma Avenue and Laguna Boulevard);
- One (1) near the northern end of the adjacent apartment building (adjacent to the eastern side of the Site building);
- Five (5) in the southwestern corner area of the Site (adjacent to the western side of the Site building); and
- Three (3) along the southern side of the Site building (adjacent to the north side of Central Avenue NW).

Prior to initiating soil boring, DE&S will contact New Mexico One-Call Systems, Inc., and all local utility companies to determine the locations of underground utilities. In order to minimize the cost for disposal and decontamination of soil cuttings, DE&S recommends that direct-push methods (i.e. Geoprobe®) be used for the soil borings completed as part of this assessment. A subcontractor will be utilized to conduct the exploratory boring advancement and sampling program. The subcontractor will be under the direct supervision of the DE&S representative and will conduct the subsurface sampling program using a truck-mounted Geoprobe® soil investigation unit. The Geoprobe® utilizes a rotary hammer mounted on a hydraulic ram that, in conjunction with the weight of the vehicle, advances a 2-inch, threaded, hollow-probed steel tube into the subsurface. Soil and groundwater samples can be extracted at discrete intervals using various down-hole tools in conjunction with the Geoprobe®.

If the Geoprobe® is not capable of penetrating the subsurface materials, then a drilling rig utilizing a hollow-stem auger drilling and sampling method will be used to complete the project. Use of a hollow-stem auger drill rig would indicate a change in the Scope of Work and associated costs. NMED will be notified immediately if hollow-stem auger drilling is required to discuss project options and to determine how to proceed. It should be noted that Geoprobe® drilling practices have previously been successful in close proximity of the Bell Trading Post property.

The DE&S Standard Operating Procedures (SOP) for the direct-push soil boring advancement and subsurface soil sampling are included in Appendix B of the Phase II Site Characterization Work Plan. Soil samples (SB-01 through SB-12) will be collected continuously from the ground surface to the terminal depth of each boring (ranging from approximately 4- to 25-feet). All soil borings will be completed to an approximate depth of 4-feet below ground surface (bgs), with the exception of soil borings SB-01, SB-03, SB-04, and SB-12 that will be completed to depths of approximately 25-feet bgs. The DE&S geologist will produce a lithologic log of each soil boring. The soil cuttings will be described in accordance with Unified Soil Classification System (USCS). Descriptions of the soil cuttings will include lithologic type, minerals present, color, particle size range, particle angularity, density, plasticity, particle sorting, moisture content, and structure.

Each soil boring will be abandoned by pouring bentonite pellets or chips into the vacant boring, then hydrating the pellets using potable water.

Each soil sample collected will be screened in the field for VOCs using a photoionization detector (PID) via heated headspace technique. The PID will be equipped with an 11.7 ionization potential electron volt lamp that provides the sensitivity necessary to identify VOCs suspected to be present in Site soils. The PID provides screening of ionizable organic compound concentrations in air and gives a direct readout in ppm. The PID determines the concentration of total ionizable VOCs, but does not differentiate between specific compounds. The operational range of the PID is 0 to 2,000 ppm, with a minimum instrument detection of 0.1 ppm. Soil samples collected for PID headspace screening will be placed in a laboratory pre-cleaned glass jars, and the jar openings will be sealed with aluminum foil. The soil samples will be allowed to reach ambient temperature either by placement in the sun and/or a warm-water bath. After the soil sample has been at ambient air temperature for approximately 10 minutes, the tip of the PID will be inserted into the jar by piercing the aluminum foil, and the reading returned will be recorded in the field notebook or appropriate field form.

The NMED USTB SOP for heated headspace reading collection is included in Appendix C of the Phase II Site Characterization Work Plan.

In each of the 4-foot soil borings, a soil sample will be collected from the 0 to 2-feet bgs interval and the 2- to 4-feet bgs interval. These soil samples will be submitted for laboratory analysis. For the deeper soil borings that are being completed to the water table contact (approximately 25-feet bgs), soil samples will also be collected from the 0 to 2-feet and the 2- to 4-feet intervals (if those soil borings are located in areas where the results may be useful for comparison as

background samples, or if the soil borings are located in an area of exposed soil where potential releases may have occurred). In addition, any soil sample exhibiting a significant PID reading, soil staining, and/or odor will be considered for submittal for laboratory analysis. Soil samples will be analyzed according to the parameters outlined in Form F-2.

In addition, a maximum of three of the soil samples will be submitted for analysis of soil geotechnical properties (parameters to be used in a potential site-specific risk analysis). These samples will be selected based upon lithology type. The geotechnical soil samples will only be analyzed if Site soil samples submitted for analytical analysis indicate the presence of metals or other contaminants of concern. Each of the three selected geotechnical soil samples will be submitted for the following soil geotechnical parameters: dry bulk density (ASTM Method D2937-94), porosity (ASTM Method D854), volumetric water content/moisture content (ASTM Method D2216-92), fractional organic carbon content in soil (ASTM Method 2974), and sieve analysis (or soil gradation analysis).

Each soil sample selected for laboratory analysis will be placed in glass jar with a Teflon™-lined lid, labeled with the location, time, and date of collection, sampler's name, and required analyses. The soil samples selected for laboratory analysis will be immediately placed in a cooler filled with ice for delivery to the contract laboratory. Standard chain-of-custody procedures will be adhered to throughout the investigation.

All drilling equipment used for boring advancement will be steam-cleaned prior to drilling to remove oils, chemicals, and soil. All soil boring equipment will also be steam cleaned between locations to eliminate the possibility of cross contamination between two borings. Sampling tools will be decontaminated between each use, using established protocols. Equipment decontamination procedures are outlined in Appendix D of the Phase II Site Characterization Work Plan.

Groundwater Sample Collection

Four of the Geoprobe® soil borings (SB-01, SB-03, SB-04, and SB-12) will be completed to a depth of approximately 25-feet bgs. Groundwater samples will be collected at these locations. Two of these groundwater samples will be collected near the northeastern corner of the Site, one groundwater sample will be collected from the southeastern corner of the Site, and one groundwater sample will be collected from near the northwestern corner of the Site.

The locations of the proposed groundwater sample collection points are shown on Figure 2 in the Phase II Site Characterization Work Plan. These locations were chosen based on their proximity to the Site property corners and local groundwater flow direction (to the east, southeast).

Each groundwater sample will be collected from each Geoprobe® soil boring by constructing a mini-well. The mini-well will be constructed of 1.0 inch-diameter schedule 40 PVC casing. The lower 5 feet of the casing will be slotted (0.01 inch). Polyethylene tubing will then be placed inside the casing and groundwater will be removed from the Geoprobe® soil boring using a

peristaltic pump. The mini-well casing and polyethylene tubing will be discarded after use by the drilling subcontractor.

All groundwater samples collected for laboratory analysis will be analyzed for those parameters outlined in Form F-2.

Quality Assurance

QA/QC samples for the soil samples will consist of field duplicates and equipment (decon) blanks. A duplicate is obtained by collecting two samples at one sampling location and labeling one sample as the primary sample name and the other as a field duplicate. The time of collection should be left off the sample container label and chain-of-custody (COC) so that the analytical laboratory does not have an indication of which sample is the field duplicate. In addition, one equipment blank per day will be collected. The equipment blanks will be analyzed in the same manner as the primary samples.

QA/QC groundwater samples will be collected at a minimum frequency of 5 % (or 1 for every 20 samples) and will include duplicate samples, field blanks, and equipment rinsate blanks. There will be one trip blank per cooler shipment, if samples are collected for VOA analyses. The field blank sample will be collected by pouring deionized water through the air into a sample container at the Site. The rinsate sample will be collected after decontamination of the equipment by pumping deionized water through the sampling pump or sampling device. Trip blanks will be provided in the sample cooler and accompany the samples from the Site to the contract laboratory. Trip blank samples will only be analyzed if unusual or unexpected laboratory results are identified in the primary samples.

The selected laboratory's QA/QC Plan will be followed, which should require matrix spike and method blank samples to be run at frequencies dictated by laboratory certification requirements. The analytical laboratory will have State- and EPA certifications for conducting the specific analytical methods.

Equipment Calibration

A PID will be used to monitor for VOCs in air. PIDs are capable of registering organic vapor concentrations in ppm and are useful as a qualitative rather than quantitative measurement of volatile concentrations because the PID cannot distinguish between different constituents in the air. Quantitative measurements can be obtained if, for example, only one organic compound is present and the PID has been calibrated for that particular compound.

PIDs can also be used for field screening of soil, waste, and water (agitated) to aid in the selection of samples to be sent to the laboratory for volatile and semivolatile analyses.

PIDs are normally calibrated at the Site with isobutylene as the span gas. Calibration should be performed at the beginning of each day and additionally thereafter if the PID becomes visibly

dirty or performs questionably. Calibration procedures for a typical PID are summarized in the following paragraphs.

Calibrating a PID includes zeroing the instrument (setting the instrument reading to "0"), connecting it to the calibration gas canister, and adjusting the instrument's span control to match the concentration of the calibration gas. PID calibration gas is typically referenced to benzene in which case it consists of approximately 100 ppm isobutylene in an air matrix. The accuracy of the span gas is typically around +/- 1.0 ppm and this error range may need to be applied to individual readings when determining if specific PID readings are above or below an action level. Typically, a PID can be calibrated in 5 to 20 minutes. If the PID is used in a high humidity environment (90 percent and above), it may require a special calibration process discussed in the owner's manual. PID users will reference the calibration instruction provided by the owner's manual when unfamiliar with specific calibration procedures.

It is important to note that with digital read out PIDs, the minimum detection limit and the increment at which readings are displayed are calibration dependent. Because these parameters may vary after each calibration, they should be determined after each calibration by gradually releasing increasing amounts of span gas to the PID probe. For example, assume the following readings were obtained after calibration: 0.3, 0.6, 0.9, and 1.2 ppm. From this information, it can be determined that the minimum detection limit is 0.3 ppm and the increment at which results are displayed is also 0.3 ppm. Therefore, an actual reading of 0.4 ppm may round down and be displayed as 0.3 ppm, while 0.5 may round up to 0.6 ppm. If the increment is found to be 1 ppm or larger, the PID should be cleaned and recalibrated to achieve an increment that is less than 1 ppm.

A parameter that must be considered when using the PID is its calibration error. For example, if a PID is calibrated to 100 ppm \pm 2 ppm, the maximum calibration error is 2%.

When using a PID to monitor organic vapors emitted from a source material that has been collected in a sample container, the following will be noted in the field logbook or appropriate field forms:

- maximum organic vapor concentration;
- date and time of monitoring;
- location of sample;
- operator's name/initials; and
- approximate ambient temperature.

When a PID becomes visibly dirty or performs questionably, it may be time for the instrument to be cleaned and/or recalibrated. The PID probe should be unscrewed and visually inspected for dirt and moisture. If necessary, the probe can be cleaned with a soft cloth or tissue. It may also be rinsed with deionized water if sufficient time is allowed for drying before it is reattached to the PID. If questionable performance persists after cleaning the probe and recalibrating the PID, the lens covering the ultraviolet lamp can be cleaned gently in accordance with the PID owner's manual. Although PIDs provide a means of checking the charge of the battery, it is a favorable

practice to recharge the battery during instrument inactivity. The PID owner's manual will be utilized as necessary in addressing general maintenance of the instrument.

Other field instruments, such as the pH and conductivity meters will be calibrated according to manufacturer's instructions. Instruments are calibrated at least once each day, before work begins. If instrument readings are unstable or appear to be out of range of anticipated values, the instrument will be recalibrated before additional data are collected. All calibration information and data will be recorded each day in the field notebook.

Laboratory Analysis

A local laboratory, Hall Environmental Analysis Laboratory, Inc. (HEAL) will perform the sample analyses. HEAL will be responsible for assuring the accuracy and integrity of the analytical results using accepted QA/QC procedures. HEAL's QA/QC Plan will be followed, which requires matrix spike and method blank samples to be run at frequencies dictated by laboratory certification requirements. HEAL meets the definition of a qualified laboratory as defined by NMED USTB regulations 20.5.1 NMAC § 112.96 and using the analytical protocols specified in Water Quality Control Commission (WQCC) Regulations 20.6.2 NMAC § 3107.B. The following summarizes the laboratory analyses to be performed:

Chemicals Potentially Used at the Site	Sample Matrix	Analysis	Number of Samples*	EPA Method Number(s)
Sodium cyanide, sodium carbonate	ground water	sodium	5	200.7
Sodium cyanide, potassium cyanide, potassium ferricyanide	soil/ground water	cyanide	13 soil/5 gw	335.4
Potassium cyanide, potassium tetraborate, potassium bromide, potassium aluminum sulfate, potassium chromium sulfate, potassium ferricyanide	ground water	Potassium	5	200.7
Calcium sulfate	ground water	calcium	5	200.7
Potassium bifluoride	ground water	fluoride	5	340.1
Sodium carbonate	ground water	carbonate	5	300.0
Sulfuric acid, calcium sulfate, potassium aluminum sulfate, potassium chromium sulfate	ground water	sulfate	5	300.0
Nitrates	ground water	Nitrate - Nitrite	5	353.2
Ammonia hydroxide	ground water	ammonia	5	350.2
Metals	soil/ground water	WQCC Metals (list)**	13 soil/5 gw	6010
Zinc	soil/ground water	Zinc	13 soil/5 gw	6010
Mercury	soil/ground water	mercury	13 soil/5 gw	7470/7471A
Sulfuric Acid	soil/ground water	Acid/Base (pH)	13 soil/5gw	150.1 gw 9045 soil
Hydrogen peroxide	ground water	Dissolved Oxygen	5 gw	Field Meter

Chemicals Potentially Used at the Site	Sample Matrix	Analysis	Number of Samples*	EPA Method Number(s)
N/A	soil	Fractional Organic Carbon	4 soil	2974
N/A	soil	Sieve Analysis	4 soil	D422-63
N/A	soil	Specific Gravity	4 soil	D2932-94
N/A	soil	Moisture Content	4 soil	D2216-92
N/A	soil	Bulk Density	4 soil	D2937-94
N/A	soil	Dry Sieve Analysis	4 soil	D422-63

Notes:

* - This is a minimum number of samples for analyses. Additional samples may be collected based upon field screening criteria.

** - NMWQCC Metal analyte list includes: Arsenic, Barium, Cadmium, Chromium, Lead, Mercury (total), Selenium, Silver, Copper, Iron, Manganese, and Zinc.

Sample Labeling and Handling

Samples are labeled in the field at the time of collection. Pertinent information is recorded on the label with an indelible pen. Information on the label must match the chain-of-custody (COC) documentation described below.

Sample Custody

Field COC will be maintained for each sample collected and for associated QA samples. Proper sample handling and custody procedures ensure the custody and integrity of each sample from the time of collection, through sample transport, receipt, preparation and analysis. The sample ID, location, sampling time, date, sample matrix, depth (if applicable), analyses requested, number of containers for each sample, and sampler's signature will be recorded on the COC form. The COC form will be completed and placed in the sample cooler for delivery to the laboratory. Copies of all COCs will be included in the final report.

When the samples are received in the laboratory, the Sample Custodian signs them in and checks the temperature of the cooler. After checking the COC for completeness, the Sample Custodian will sign the form and record the time of arrival and the date.

Quality Control

QA/QC samples associated with the soil samples collected will consist of field duplicates and equipment rinsate blanks. Field duplicates will be collected at an approximate frequency of one for each 20 samples (a minimum of 1 duplicate sample for groups of samples <20). A duplicate is obtained by collecting two samples at one sampling location and labeling the sample as the

primary sample name and also as a field duplicate. The time of collection should be left off the sample container label and COC so the analytical laboratory does not have an indication of which sample is the field duplicate. In addition, one equipment rinse blank per day will be collected. The equipment blanks will be analyzed for the same suite of analytes as the primary samples.

QA/QC ground water samples will include collection of duplicate samples (one for every 20 samples), field blanks (one), equipment rinse blanks (one), and trip blanks if samples are collected for VOA analyses (one per cooler shipment). The field blank samples will be collected by pouring deionized water through the air into a sample container at the Site. The equipment rinse samples will be collected after decontamination of the equipment by pumping deionized water through the sampling pump or sampling device.

A trip blank (laboratory-grade water in sample containers prepared prior to initiation of sampling activities) will accompany the samples at all times. Trip blanks will be provided in the sample cooler and accompany the samples from the Site to the laboratory. Trip blank samples will only be analyzed if unusual or unexpected concentrations of VOCs are detected in any of the primary samples.

QC samples will be collected for geotechnical samples. QC geotechnical samples will consist of a duplicate collected at a frequency of one for each 20 samples collected. The purpose of the duplicate geotechnical sample(s) is to provide some data on soil heterogeneity and sampling variability

Data Management and Reporting

DE&S will complete a final report describing the work completed at the Site, including the following:

- Any additional information concerning Site conditions discovered during completion of the Phase II Investigation;
- A historical summary of the background of the Site;
- A complete description of the technical approach and field methods used during field activities;
- A complete description of the results of the field investigation tasks;
- All field forms and field notes taken during the investigation;
- A risk assessment considering exposures to contaminated soil and ground water at the Site, using the Tier I approach specified in the "Technical Background Document for Development of Soil Screening Guidelines" (NMED 2000). This is equivalent to a Method 2 assessment specified in 20.6.3 NMAC 110.B;
- Conclusions and recommendations.

Title: QAPP Former Bell Trading Post
Site Name: FORMER BELL TRADING POST
Site Location: Albuquerque, New Mexico

Revision Number: 002
Revision Date: 9/29/01
Page 20 of 44

Project Timeline

Activities	Activity Start	Activity End
Soil Sampling	Upon Approval of QAPP	October 12, 2001
Ground water sampling	Upon Approval of QAPP	October 12, 2001
Report	Upon Completion of ground water sampling and receipt of laboratory analytical results.	November 10, 2001

Form F - 1

Method and SOP Reference Table

Analytical Method Reference: Include document title, method name/number, revision, number, date		Project Analytical Standard Operating Procedures (SOPs): Include document title, date, revision number, and originator's name
1a. SW-846 Test Methods for Evaluating Solid Waste: Physical/Chemical Methods, USEPA SW-846, 3 rd Edition, December 1996.		1b. N/A
Method	Title	
6010B	Inductively Coupled Plasma- Atomic Emission Spectrometry	
6020	Inductively Coupled Plasma- Mass Spectrometry	
7470/7471A	Mercury in Liquid/Solid Waste (Manual Cold-Vapor Technique)	
200.7	Cations	
300.0	Anions	
335.4	Total Cyanide	
350.2	Ammonia	
340.2	Fluoride	
353.2	Nitrate + Nitrite	
150.1	pH	
2974	Fractional Organic Carbon	
D422-63	Sieve Analysis	
D2932-94	Specific Gravity	
D2216-92	Moisture Content	
D2937-94	Bulk Density	
D422-63	Dry Sieve Analysis	

Project Sampling SOPs: Include document title, date, revision number, and originator's name	
Phase II Site Characterization Work Plan Bell Trading Post, DE&S, October 2001	
Appendix B	Direct-Push Subsurface Soil Sampling SOP
Appendix C	NMED UST Bureau Heated Headspace SOP
Appendix D	Equipment Decontamination Methods SOP
Appendix E	Investigation Derived Waste SOP

Form F-2

**Analytical Methods/Preservation/Holding times for Samples
 Bell Trading Post**

Analyte	Method	Matrix	Container	Preservation	Holding Time
Ammonia	350.1	Water	1 L HDP	H ₂ SO ₄ , pH <2 Cool to 4 °C	28 days
Anions	300.0	Water	1 L HDP	none	28 days
Cations	200.7	Water	1 L HDP	HNO ₃ , pH <2 Cool to 4 °C	6 months
Cyanide, total	335.4	Water	1 L HDP	NaOH to pH>12. Cool to 4 °C	14 days
Nitrate- Nitrite	353.2	Water	250-mL HDP	H ₂ SO ₄ , pH <2 Cool to 4 °C	28 days
Fluoride	340.2	Water	500-mL HDP	none	28 days
Ammonia	350.2	Water	1 L HDP	H ₂ SO ₄ , pH <2 Cool to 4 °C	28 days
NMWQQC Total Metals*	6010/6020	Water	500-mL HDP	HNO ₃ , pH <2 Cool to 4 °C	6 months
Mercury	7470	Water	250-mL HDP	HNO ₃ , pH <2 Cool to 4 °C	28 days
NMWQQC Total Metals±	6010/6020	Soil	4-oz glass jar	Cool to 4 °C	6 months
Zinc	6010	Soil	4-oz glass jar	Cool to 4 °C	6 months
Mercury	7470	Soil	4-oz glass jar	Cool to 4 °C	28 days
pH	150.1	Soil	4-oz glass jar	Cool to 4 °C	14 days

* - Metals analyte list includes: Arsenic, Barium, Cadmium, Chromium, Lead, Mercury (total), Selenium, Silver, Copper, Iron, Manganese, and Zinc.

Soil Geotechnical Analyses Former Bell Trading Post Site

Parameters	Sample Matrix	Sample Locations	Number of Samples	QA/QC	Total Number of Samples
Dry Bulk Density	Soil	Three soil boring locations randomly selected based on lithology	3	1	4
Porosity	Soil	Three soil boring locations randomly selected based on lithology	3	1	4
Moisture Content	Soil	Three soil boring locations randomly selected based on lithology	3	1	4
Fractional Organic Carbon Content	Soil	Three soil boring locations randomly selected based on lithology	3	1	4
Sieve Analysis	Soil	Three soil boring locations randomly selected based on lithology	3	1	4

Form G

Preventive Maintenance - Field Equipment

The maintenance of field sampling and analytical equipment is the responsibility of DE&S. These procedures are defined in the operating manual for each piece of equipment. A log book for equipment maintenance and calibration will be maintained to document corrective actions.

Instrument	Activity	Frequency	SOP ref.
PID	Calibration as described in the PID reference manual	Daily; immediately after a questionable reading	N/A

Form H

Calibration and Corrective Action - Field Equipment

Instrument	Activity	Frequency	Acceptance Criteria	Corrective Action	SOP Ref.
PID	Calibration as described in the PID reference manual	Daily and when PID readings are questionable	2%	>2% error with calibration	N/A
pH meter	Calibration as described in the instrument reference manual	Daily and when readings are questionable	2% Over/Under Normal Operating Range	>2% error with calibration	N/A
Conductivity meter	Calibration as described in the instrument reference manual	Daily and when readings are questionable	2% Over/Under Normal Operating Range	>2% error with calibration	N/A
Temperature Meter	Calibration as described in the instrument reference manual	Daily and when readings are questionable	2% Over/Under Normal Operating Range	>2% error with calibration	N/A
Dissolved Oxygen meter	Calibration as described in the instrument reference manual	Daily and when readings are questionable	2% Over/Under Normal Operating Range	>2% error with calibration	N/A

Form I

Preventive Maintenance - Laboratory Equipment

The maintenance of laboratory equipment is the responsibility of the respective laboratories. Laboratories shall maintain their equipment according to specified equipment calibration, operation, and maintenance procedures. Each laboratory in the program must establish and follow preventive maintenance procedures specific to their laboratory.

Instrument	Activity	Frequency	SOP Ref.
Gas Chromatograph (GC)	Bake Out/Calibrate	Daily	N/A
Photoionization Detector (PID)	Abrasive Powder Cleaning	Daily	N/A
Flame Ionization Detector (FID)	Normal Cleaning	Every six months or if baseline becomes less stable	N/A
Gas Cylinders	Check for sufficient amount of gas	Daily	N/A
Atomic Absorption Spectrometers	According to manufacturer's recommendations and recorded in an instrument specific logbook	As recommended	N/A

Form J

Calibration and Corrective Action - Laboratory Equipment

Definition

Calibration is defined as the set of operations by which a relationship between the response of a measuring instrument and the actual value is established. This is often achieved in a laboratory environment by performing a calibration curve, which is a series of known concentrations of a standard which are analyzed by the instrument, and the instrument's response is plotted as a function of these concentrations.

Standards

All of the standards which are used as calibration standards, laboratory control standards, and for other reference purposes shall be ordered from the most reliable commercial source available. The standards will be accompanied by a Certificate of Analysis to verify the level of quality of the standard (this also traces it to the National Institute of Standards or NIST).

In order to maintain the traceability of the standards, the Certificates of Analysis shall be dated and stored in a notebook maintained for this purpose. All working solutions, calibration curves, data reports, and quality control measurements will be labeled in such a manner so as to allow traceability back to the original standard source. All measurements shall be traceable to national standards of measurement if available.

All standards will be entered into the Laboratory Information Management System (LIMS) computer database with a complete description of the standard. Any cuts or mixing of standards will be fully tracked in the LIMS as well. Standards will be labeled with a date received into the laboratory and the date opened for use. Each new standard received into the laboratory must be verified against standards currently in use. Nothing is to be introduced into any container of stock standard solution. Rather, small aliquots will be stored in working standard solution bottles from which measured amounts will be taken.

As part of the quality assurance procedures analysts shall adhere strictly to recommended storage times for standards and prepare fresh solutions as frequently as each method requires, in order to reduce the likelihood of error caused by standards.

Procedures

Reagents

The analytical laboratory shall assure that the reagents contain the necessary quality to be used for their designated purpose. This is accomplished by ordering high quality reagents and maintaining strict control to minimize possibilities of contamination or degradation. All reagents must meet Reagent Grade specifications unless otherwise specified in the analytical method.

Upon receipt, all reagents will be assigned a separate ID# and dated and logged into the LIMS. All reagents shall be labeled with the date received into the laboratory and the date opened for use. Recommended shelf life shall be documented and controlled. Dilutions or solutions prepared shall be clearly labeled, dated, and signed.

All gases for use with an instrument shall meet specifications of manufacturer. Recommended shelf life shall be documented and controlled. All safety requirements relating to maximum/minimum allowed pressures, types of fittings, and frequency of leak checks shall be followed. When a new tank of gas is delivered, it shall be checked for leaks and marked with the date put in use. The date and initial pressure of a new tank will be noted on the new tank.

The Quality Assurance Procedure for determining the quality of laboratory reagent water is designed to insure that the water used at the laboratory for all analytical methods meets established criteria. Continuous monitoring not only assures the quality of the reagent water but also provides the necessary indicators for maintenance of the purification systems.

Analytical balance

All of the analytical balances at the laboratory shall be capable of weighing to a minimum precision of 0.1 grams. Records shall be kept of daily calibration checks for the balances in use. Class S weights shall be used in these checks.

pH Meter

The pH meter shall measure to a precision of 0.01 pH units. Records will be kept showing its calibration before each use, or each day, if used more than once per day. The pH meter will be calibrated using a certified buffer. Also available with the pH meter will be a magnetic stirrer and a temperature sensor. Aliquots of a standard buffer solution shall be used to calibrate the instrument.

Thermometers

The thermometers in the laboratory will be used to measure the temperatures of the refrigerators, oven, and water bath.

Refrigerators

Each laboratory refrigerator shall contain a thermometer capable of measuring to a minimum precision of 1° C. The thermometers shall be kept with the bulb immersed in liquid. Each workday, the temperature of the refrigerators will be examined and recorded in the refrigerator logbook along with the initials of the analyst, to insure that the refrigerators are kept between 2°C and 6°C (4° C \pm 2° C). Samples will be refrigerated separately from the standards to reduce the risk of contamination.

Ovens

The oven shall contain a thermometer graduated by 1° C. The temperature will be measured before and after a cycle when the operating procedure demands this level of precision.

Gas Chromatographs (GC's) and Ion Chromatography (IC)

A calibration curve shall be run and analyzed at least monthly, often daily, for each test, in order to verify the linear range of the instrument. The calibration curve consists of the analysis of a blank and a minimum of five dilutions of a calibration standard composed of the compounds for which the tests are run. The calibration standard will be obtained from a commercial laboratory, and certified to contain the appropriate quality. The quality assurance program also will require that a laboratory control sample (LCS) be analyzed. The LCS is an independent source of the standard or is a standard solution prepared from the same neat source, but at a different time. The independent source is the preferred method and shall always be used unless no independent source can be found. The calibration standards are traceable to the EPA repository samples or equivalent. A LCS shall also be run with the calibration curve.

Each day that a test is run on the instrument, one of the calibration points shall be analyzed to verify the calibration of the instrument. It will also be analyzed at the end of the batch or more frequently if specified in the method to insure consistency of the instrument. If for any reason the curve criteria are no longer being met during any point of analysis, the curve will be redone for a new calibration. A reagent blank shall also be run daily to ensure that no contamination is present at detectable levels.

The LCS must be within 20% of the quantitation based on the calibration curve or the calibration will be redone (the curve is out-of-control). If the calibration is not valid due to an out-of-control LCS then both the standards and the LCS will be examined to determine which is most likely to be the source of the discrepancy.

Atomic Absorption Spectrometers

Calibration curves are established from analysis of three standards. The initial calibration verification (ICV) is made from a second source standard. A continuing calibration blank (CCB) and a continuing calibration verification (CCV) are analyzed at a frequency of 10%.

Other Analytical Instrumentation and Equipment

The conductivity probe constant shall be determined prior to use.

Eppendorf (or equivalent brands) pipettes will be checked for accuracy at least on a weekly basis.

Form K

Sample Handling and Custody Requirements

Sampling Procedures

Sample kits will be prepared and provided by the analytical laboratory upon request. The sample kits will contain the appropriate sampling containers with a preservative when necessary, labels, blue ice, a cooler, chain-of-custody forms, plastic bags and bubble wrap, and any special sampling instructions.

Containers

Containers that are sent out for sampling will be purchased by the laboratory from a commercial source. They must have an "EPA Cleaned" QA level of 1. The sample containers will be received with a Certificate of Analysis which verifies that the lot of sample containers have been cleaned according to the EPA wash procedure described in the EPA Statement of Work "Specifications and Guidance for Obtaining Contaminant-Free Sample Containers", and tested to insure compliance with EPA specifications set forth in the EPA Statement of Work "Superfund Analytical Methods for Low Concentration Water for Organics Analysis 6/91" or "The Superfund Analytical Method for Low Concentration Water for Inorganic Analysis 10/91".

Preservation

If testing for volatile organic compounds, a preservative, typically HgCl_2 or HCl will be added to the sampling vials beforehand at the contract analytical laboratory. The preservative shall be put into the vials in uniform amounts and done so quickly in order that risk of contamination is minimized. Vials that contain a preservative will be labeled appropriately.

Sample Custody

Chain-of-Custody Form

The chain-of-custody (COC) record will contain the client's name, address, and phone and fax numbers, the name and number of the project, the project manager's name, and the sampler's name. It shall also list the date and time the samples were taken, the matrix, ID number, number/volume of containers, and preservative used in the samples. When applicable, the COC record also will identify whether or not the samples are cold upon receipt upon delivery to the laboratory and whether or not they contain air bubbles (or headspace).

There shall also be a space on the COC to record the unique contract analytical laboratory sample number assigned to each respective sample after they are received. Next to the sample information on the COC will be a space for the client to indicate the desired tests to be performed. Finally, there will be a section on the COC to track the custody of the samples containing lines for signatures, dates and times when samples are relinquished and received. The COC form will also include a space to record special instructions (such as additional tests, time constraints, and/or disposal considerations).

Receiving Samples

An authorized laboratory employee shall receive samples, where the COC form will be compared to the samples to check for its completeness and accuracy. The sample information will be compared to what is written on the chain-of-custody record. After it is determined to be complete and accurate, and the sampler has signed the COC form relinquishing custody of the samples, the contract analytical laboratory representative shall sign the COC in the appropriate location, receiving custody of the samples. The date and time will be recorded next to the laboratory representative signature on the COC form. The COC form will be designed in triplicate. The third copy of the COC form will be given to the person who has just relinquished custody of the samples as confirmation of sample receipt by the laboratory. If a courier delivers the samples, the laboratory staff member will inspect the samples and the COC form, and notify the client in the case of any discrepancies.

Logging in Samples and Storage

The contract analytical laboratory standard operating procedure will be used to ensure correctness of the login procedure. Labels with the contract analytical laboratory numbers are generated for the samples and placed on the containers. The Login Supervisor will check sample sets at the contract analytical laboratory before they are dispersed to the appropriate storage refrigerator.

Each project will be entered into the LIMS with a unique ID# given to every sample container. The ID# tag includes the laboratory sample ID#, client sample ID#, date and time collected, and the analytical tests to be performed. At any computer station throughout the laboratory an analyst or manager may inquire about a project. The LIMS will be continuously updated throughout the laboratory.

Samples will be stored in the volatiles section refrigerator, the semi-volatiles section refrigerator, or the inorganics section refrigerator, depending on the nature of the analyses. The soil samples that must be extracted for both a volatile analysis and a semi-volatile analysis will first be placed into the volatiles soil sample refrigerator. After the volatiles extraction, they will be stored in the semi-volatiles refrigerator to minimize any risk of contamination.

Disposal of Samples

All samples and other laboratory wastes will undergo testing to characterize if they are regulated or not. These wastes will be disposed of according to whether or not they are determined to be hazardous as well as the type of contaminant. The wastes will be separated into four categories: hydrocarbons, PCB's, inorganics (heavy metals), and other organics (pesticides, herbicides, solvents, etc.). Aqueous based samples and wastes that are considered hazardous will be allowed to evaporate under a hood and disposed of as a solid waste. The wastes that are determined to be non-hazardous will be disposed of as non-hazardous waste.

Form L

Analytical Precision and Accuracy

Accuracy

The accuracy of an analysis refers to the difference between the calculated value and the actual value of a measurement. The accuracy of a laboratory result will be evaluated by comparing the percent recovery of the QC reference material with its established concentration, independent of routine calibration. It will be used as prepared, or diluted with an inert matrix as a blind environmental sample. Statistically based control limits will be established for each method of analysis and sample matrix. Recoveries will be assessed to determine the method's efficiency and matrix interference effects.

Analytical accuracy is expressed as the percent of recovery of an analyte/parameter that has been added to the environmental samples at a known concentration before preparation and analysis. The equation used to calculate percent recovery is as follows:

The contract analytical laboratory shall require that the Percent Recovery to fall within the 99 % confidence interval of established control charts, and a value that falls outside of the 95 % confidence interval requires a warning and process evaluation. The confidence intervals are calculated by determining the mean and sample standard deviation. If control charts are not available, the range of 85 to 115% shall be used. Percent Recoveries outside of this range shall mandate additional action such as analyses by Method of Standard Additions, additional sample preparation where applicable, method changes, or possible out-of-control action.

Precision

The contract analytical laboratory shall use sample duplicates to assess precision. A duplicate sample (when possible) shall be analyzed for each batch of 20 samples (5% frequency). The basic precision statistics obtained from the multiple batch frequency will be compared to develop a graph assessment (using control limits) for given sample matrix.

The contract analytical laboratory requires the Relative Percent Difference (RPD) to fall within the 99 % confidence interval of established control charts or a RPD of less than 20 if control charts are not available. RPD's greater than these limits will be considered out-of-control and require an appropriate response (results near the analytical detection limit of particular analytical methods often will have RPD's greater than 20). Allotments will be made in these situations on the basis of sample type and methodology.

Method Detection Limits

The method detection limit is the minimum concentration of a substance at which it can be identified, quantified, and reported with a 99% level of confidence that the analyte concentration is greater than zero. The limits are determined by conducting a study in which a low level of the

target substance is measured in identical trials. The same instrument must be used in a set of trials, and the sample matrix must also be identified.

First, estimate the detection limit, and then a laboratory standard will be prepared which will contain an analyte concentration of two to five times the estimated detection limit. Then, prepare at least six aliquots of this laboratory standard and process them as one would a sample, and calculate the concentration according to the appropriate laboratory procedure. In addition, a sample standard deviation (s) will be calculated using the replicate measurements.

The method detection limit (MDL) can then be calculated according to the formula:

$$MDL = s * t(99\%)$$

t (99%) is the student's t value for the 99% confidence interval. It depends on the number of trials used in calculating the sample standard deviation, so the appropriate value will be chosen according to the number of trials.

Number of Trials	t(99%)
7	3.143
8	2.998
9	2.896
10	2.821
11	2.764
16	2.602
21	2.528

Form M

Field Quality Control Requirements

The procedures and requirements contained in EPA Requirements for Quality Assurance Project Plans, October 1997, will be followed, if applicable, and they are referenced below. The portion of the EPA Quality Assurance Project Plans pertaining to field sampling will be followed.

The following QC checks will be implemented for soil and ground water samples. Sampling personnel will be required to collect and submit the following QA/QC samples to meet the data quality objectives for definitive data:

- A duplicate sample will be submitted for every 20 samples collected per matrix, including geotechnical samples.
- A trip blank sample will be submitted with every cooler containing VOC samples.
- A field blank will be collected once a week when VOC samples are being collected.
- An equipment blank sample shall be collected prior to the use of any reusable equipment and subsequently at least once a week or every eleventh time, whichever is less. Equipment blanks shall be collected immediately after the equipment has been decontaminated. Equipment blanks do not need to be collected for disposable or dedicated sampling equipment. All disposable sampling equipment must be certified clean.

Duplicated and blank samples will be given unique sample numbers and station location identifiers.

QA/QC activities will be performed in accordance with this QAPP. QA/QC samples will consist of field duplicates and a control blank. Field duplicates will be collected at every twentieth headspace sampling location. In addition, a control blank (empty laboratory pre-cleaned glass jar) will be analyzed for organic vapors every fifth headspace sample. The duplicate results will be compared to the primary sample and recorded.

The PID will be calibrated a minimum of one time each day it is used in the field. In addition, it is recommended that after any unusual PID reading is identified, the PID be immediately re-calibrated.

QC Sample	Frequency	Acceptance Criteria	Corrective Action
Duplicate	5% per parameter per matrix	<5%	>5%
Equipment Blank	Prior to the use of any reusable equipment and subsequently at least once a week or every eleventh time, whichever is less	<5%	>5%
VOC Trip Blank	1 per cooler if VOCs analyzed	N/A	N/A
VOC Field Blank	1 per week	N/A	N/A

Revision Number: 002
Revision Date: 9/29/01
Page 37 of 44

[illegible]

Title: QAPP Former Bell Trading Post
Site Name: FORMER BELL TRADING POST
Site Location: Albuquerque, New Mexico

Revision Number: 002
Revision Date: 9/29/01
Page 38 of 44

WATER PURGING AND SAMPLING DATA

PROJECT NAME: _____ SAMPLE LOCATION NO. OR BORING/WELL NO.: _____

PROJECT NO.: _____ TECHNICAL CREW: _____

DATE: _____ FORM COMPLETED BY: _____

WEATHER: _____ LEVEL OF PROTECTION: ☐ A ☐ B ☐ C ☐ D

SAMPLING METHOD: _____ INITIAL WATER LEVEL (BMP) (FT): _____ @ TIME _____

WELL VOLUME (ANNULUS) (GAL): _____ WELL CASING VOLUME (PIPE) (GAL): _____

WELL VOLUME TO BE REMOVED (GAL): _____ MINIMUM _____ MAXIMUM _____

TIME ELAPSED FROM FINAL DEVELOPMENT/PURGING: _____ PUMPING RATES/SAMPLING: _____

SAMPLING DEPTH INTERVAL (BLS) (FT): _____ SAMPLE COLLECTION PERIOD: START: _____ FINISH: _____

WATER QUALITY INSTRUMENTS

DATE/TIME	INSTRUMENT	SERIAL NO.	CALIBRATION PERFORMED	TECH	COMMENTS

WATER QUALITY READINGS DURING PURGING

DATE/TIME	TOTAL WATER PURGED (gal)	TEMP <input type="checkbox"/> °C <input type="checkbox"/> °F	CONDUCTIVITY (μS/cm)	pH	TECH	COMMENTS

COMMENTS: _____

Form O

Assessment and Response Actions

The limits that have been defined for data acceptability also form the basis for corrective action initiation. Initiation of corrective action occurs when the data generated from spikes and sample duplicates exceeds the 99 % confidence interval. If corrective action is necessary, the analyst will take the following steps to determine and correct the measurement system deficiency:

- Check all calculations and measurements data (standardization, calibration, concentrations, instrument stability, etc.)
- Check equipment to ensure that components are functioning properly.
- Check reagents (age, preparation, concentrations, etc.)
- Assure that proper procedures were followed.
- Reanalyze all samples run in conjunction with the duplicate and/or spike.

In the case that a sample is treated differently than is in the documented procedure, a corrective action report will be filed explaining the reason. If deficiency continues, the analyst will consult with the appropriate senior staff member.

A second mechanism for initiation of corrective action is that resulting from Quality Assurance activities concerned with performance audits, system audits, inter and intra-laboratory comparison studies, and QA program audits conducted by EPA personnel. Corrective Actions initiated through this mechanism will be monitored and coordinated by the laboratory QA officer.

Form P

All data reported must be of the highest possible accuracy and quality. During the processes of data reduction, validation, and the writing of the reports, the work is thoroughly checked and rechecked to insure that possible sources of error are minimized.

Data Reduction

The data reduction is usually performed by the chemist who conducted the test. The calculations typically include confirmation of the surrogate recovery, response factor calculations for manual calculations, the manual calculation of the unknown using the above produced response factors, and other miscellaneous calculations related to the samples.

If the computer is used for calculations then the formulas must be confirmed by hand calculations for at least the initial use. The formulas are printed or hand copied and then stored with the first usage when applicable.

Validation

The data is validated by a senior chemist, and is performed especially frequently in the initial part of a chemist's tenure with Hall Environmental Analysis Laboratory. The data is spot checked a minimum of 20% of the time after the analyst has shown that he is competent and understands the calculations. If an error is detected, all of the current data generated by that analyst is reviewed. It is especially important for the person checking the data to be aware of the past mistakes that have been made and to highlight the validation in those areas.

Data is reported using the most significant digits available that are within the practical limitations of the instruments and methodology. In most cases, two significant digits are utilized, but three significant digits are used in the case of LCS calculations. Significant digits are rounded at the conclusion of the calculations for reporting and not before, so that the added capabilities of the computer assist in precision, so long as the significant digits are rounded at the correct time.

If data is to be transferred from one medium to another (besides printing), the transfer is checked a minimum of 20% of the time. This includes typing the data, entering the data into the computer, writing the data from the chromatogram onto a data entry sheet for further calculations, using the data in the body of the cover letter, and when results are combined with other data.

All data is written in the run log that is by every instrument, on the chromatograms themselves, or on a full size sheet of paper that can be attached to the chromatogram for permanent archiving. Non-standard forms are not used.

All data that is being reported is treated with the utmost respect and care as this helps eliminate preventable errors. Every report has at least one of the final results calculated from the beginning raw data. This eliminates any system-wide errors and is placed in the final report

Reports and Records

All reports are reviewed and signed by either the laboratory manager or one of the managers. While typing reports, the client's ID is compared with the laboratory ID in both the c-o-c and the data reduction forms. This acts as a check to insure that correct results are reported for the correct samples. Lab results and reports are released only to those persons included on the COC.

When a project is completed, the project file folder is stored with a hard copy of the report and relevant data and quality assurance and control worksheets. These folders are kept in file boxes and are arranged by the project number. Additionally, all electronic data is backed up daily by the server, this includes chromatograms and report documents. Hard copies of chromatograms are stored separately according to the instrument and the date run. All records and reports of analytical data shall be retained in a secure location, as permanent records for a minimum period of five years unless specified in a client contract.

Project Reports

The final report for this project is a contract deliverable that will be submitted to NMED in draft form comments, prior to being finalized. The final report will include information such as a description of field activities, sample location information, analytical results, description of any deviations from the work plan, a summary of results and recommendations for additional work, if deemed necessary. All field recording sheets, outputs, and worksheets for calculating results will be retained in the Site case files and provided in the final report Appendices.

Form Q

Verification of Sampling Procedures

The field sampling team will familiarize itself with work plan requirements and SOPs for the project. All pertinent information concerning samples collected will be recorded in detail in the field logbook. Any necessary deviations from the Work Plan and SOPs will be recorded in the logbook. The Field Project Manager will review the field logbook(s) each day for consistency and completeness. Deviations from Work Plan requirements will be reported immediately to the NMED ADM and the Quality Assurance Officer, so that decisions for corrective action can be made, if necessary, before work proceeds. All data will be reviewed to determine if it is representative and reasonable, in light of known Site conditions.

Data Verification and Validation

All data collected from field measurements and all data that are the result of laboratory analysis will be reviewed for integrity and conformance to project requirements, to ensure that they met the data quality objectives specified above. Only data that are supported by appropriate quality control data and meet the data quality objectives will be considered acceptable. When problems are identified with quality control data, data will be labeled with an appropriate "qualifier" to limit its appropriate use. The NMED Quality Assurance Manager will be responsible for verifying that all data collected meet the data quality objectives of the project and are suitable or reporting.

Form R

Data Usability

Data collected for this project should be usable for assessing surface and subsurface soil conditions and for determining upgradient and downgradient water quality data relative to the types of contaminants observed previously at the Site. These data should be suitable for comparison with applicable standards and guidelines to determine potential risk associated with use of the Site for a commercial enterprise. The data will also be used for initial remediation planning, including preparation of initial cost estimates for various remedial options.

REFERENCES CITED

- Bjorklund, L. J., and B. W. Maxwell, 1961. *Availability of Ground Water in the Albuquerque Area, Bernalillo and Sandoval Counties, New Mexico*, New Mexico State Engineer Technical Report 21.
- Chamberlin et al. (R. M. Chamberlin, J. M. Gillentine, C. S. Haase, J. W. Hawley, R. P. Lozinsky, and P. S. Mozley), 1992. *Hydrogeologic Framework of the Northern Albuquerque Basin*, Open-File Report 387, New Mexico Bureau of Mines and Mineral Resources, New Mexico Institute of Mining and Technology, Socorro, New Mexico, September 1992.
- Duke Engineering & Services, 2001. *Phase II Site Characterization Work Plan, Bell Trading Post Property, Albuquerque, New Mexico*, October, 2001.
- Duke Engineering & Services, 2001. "Scope of Work and Cost Proposal Task 1, Further Investigation into Chemical Use and Disposal associated with the Bell trading Post Property, 1503 Central Avenue, Albuquerque, New Mexico," March 30, 2001.
- Keers Environmental, 2000. "Phase I Environmental Site Assessment, Bell Trading Post & Adjacent Parcels, 1503 Central Avenue NW, Albuquerque, New Mexico," December 18, 2000.
- Keers Technical Services, 1994. "Limited Subsurface Investigation at 1503 Central Avenue, NW, Albuquerque, New Mexico," April 26, 1994.
- Kelley, V. C., 1977. "Geology of Albuquerque Basin, New Mexico, Memoir 33," New Mexico Bureau of Mines & Mineral Resources, a Division of New Mexico Institute of Mining & Technology, Socorro, New Mexico.
- Kernodle, J. M., D. P. McAda, and C. R. Thorn, , 1995. "Simulation of Ground-Water Flow in the Albuquerque Basin, Central New Mexico, 1901-1994, with Projections to 2020," U.S. Geological Survey Water-Resources Investigations Report 94-4251.
- Interview with Mr. J. T. Michelson on April 18 and May 3, 2001.
- Interview with Mr. Steven Donahue on May 8, 2001.
- Interview with Mr. Norman Pricer on May 10, 2001.
- New Mexico Environment Department, 1999. *New Mexico Voluntary Remediation Regulations (20 NMAC 6.3)*. Santa Fe, New Mexico, July 15, 1999.
- New Mexico Environment Department; 2000; *Technical Background Document for Development of Soil Screening Levels*; completed by NMED personnel staff November 6, 2000.
- Thorn, C. R., D. P. McAda, and J. M. Kernodle, 1993. *Geohydrologic Framework and Hydrologic Conditions in the Albuquerque Basin, Central NM*, U.S. Geological Survey, Water-Resources Investigation Report 93-4149.
- United States Environmental Protection Agency, Effluent Guidelines Division, 1981. "Guidance Document for the Control of Water Pollution in the Photographic Processing Industry" dated April 1981.

PHASE II SITE CHARACTERIZATION WORK PLAN

**Former Bell Trading Post Property
Albuquerque, New Mexico**

Prepared for:



The New Mexico Environment Department
Voluntary Remediation Program
1190 St. Francis Drive
Santa Fe, New Mexico 87504

Prepared by:



One Park Square
6501 Americas Parkway NE, Suite 810
Albuquerque, New Mexico 87110

October 1, 2001

TABLE OF CONTENTS

<u>Section</u>	<u>Page</u>
EXECUTIVE SUMMARY	iii
1.0 INTRODUCTION	1
1.1 General Project Background	1
1.2 Site History	1
1.3 Potential Contaminants of Concern	1
1.4 Other Environmental Issues of Concern	2
1.5 NMED Requirements for Phase II Investigation	3
1.6 Work Plan Overview	3
1.7 Prior Reports Review/Historical Site Uses	3
1.8 Interviews	4
1.9 Recognized Environmental Conditions	5
2.0 SITE SETTING	7
2.1 Geologic and Hydrogeologic Setting	7
2.2 Adjoining Property Usage and Potential Receptors	7
2.3 Site Location	8
3.0 PAST OPERATING PROCEDURES	8
3.1 Jewelry Manufacturing	9
3.1.1 Chemical Storage	10
3.2 Photograph Development	11
3.2.1 Black and White Photograph Development	12
3.2.2 Color Photograph Development	12
4.0 SAMPLING AND ANALYSIS ACTIVITIES	14
4.1 Purpose of Investigation	14
4.2 Sampling and Analysis	14
4.2.1 Soil Boring Installation and Continuous Soil Sampling	14
4.2.2 Ground Water Sample Collection	16
4.3 Quality Assurance Measures	17
4.4 Data Evaluation	17
4.5 Laboratory Analysis	18
4.6 Equipment Decontamination and Investigation Derived Waste	18
4.7 Project Organizational Chart	18
5.0 DELIVERABLES AND SCHEDULE FOR COMPLETION OF WORK	19
6.0 DISCUSSION OF HOW PROPOSED ACTIVITIES MEET THE VRP PERFORMANCE STANDARD	20
7.0 REFERENCES	21

LIST OF FIGURES

<u>Figure</u>	<u>Title</u>
1	Site Location Map – Bell Trading Post Property
2	Proposed Soil Boring/Ground Water Sample Locations

LIST OF APPENDICES

<u>Appendix</u>	<u>Title</u>
Appendix A	Health and Safety Plan
Appendix B	Direct-Push Subsurface Soil Sampling Standard Operating Procedure
Appendix C	New Mexico Environment Department Underground Storage Tank Bureau Heated Headspace Standard Operating Procedure
Appendix D	Equipment Decontamination Methods Standard Operating Procedure
Appendix E	Investigation Derived Waste Plan

EXECUTIVE SUMMARY

This document presents the Phase II Site Characterization Work Plan for soil and ground water sampling and analysis at the Former Bell Trading Post Property (Site) located in Albuquerque, New Mexico. This document was prepared based on letter correspondence and discussions with State of New Mexico Environment Department (NMED) and City of Albuquerque (COA) representatives. This Work Plan was prepared for the NMED Ground Water Quality Bureau's Voluntary Remediation Program (VRP) and follows the Duke Engineering and Services (DE&S) "Scope of Work and Cost Estimate" (SOW) submitted to NMED on March 30, 2001.

The Site consists of approximately 2.5 acres near Old Town Albuquerque and is bounded to the south by Central Avenue, on the north and northeast by Roma Avenue, on the northwest by Fifteenth Street, to the east by an apartment complex and a vacant business, and to the west by Laguna Boulevard. The Site is located in Bernalillo County, New Mexico. Currently, there is one large (approximately 30,000 square feet) vacant building on the Site (1503 Central Avenue NW).

Prior to 1947, historical uses of the property were primarily residential. After 1947, historical property use was commercial. From 1947 until 1975, Bell Trading Post occupied the Site building and conducted commercial jewelry manufacturing. The Site is identified as vacant from 1976 until 1982. From approximately 1982 until 1984, Albuquerque Photo Lab occupied the Site building and performed commercial film development. Finally, from 1985 until 1992, Michelson Metals occupied the Site building, using the property as an office for commodity trading only (office use, non-industrial). Site property owner Mr. J.T. Michelson has stated that neither metal work nor jewelry production occurred at the Site after 1975 (Interviews with Mr. J. T. Michelson on April 18 and May 3, 2001).

Based on limited background research of the jewelry manufacturing industry and current jewelry industry practices, the following chemicals are likely to be present at a jewelry manufacturing facility: sodium and/or potassium cyanide, hydrogen peroxide, sulfuric and boric acids, ammonia hydroxide, calcium sulfate, sulfured potash, potassium bifluoride (and potassium tetraborate), and heavy metals such as gold, silver, and copper.

Chemicals used in the development of black and white photographic films are: silver halide (contained in emulsifiers); hydroquinone, metol, and phenidone (used as developing agents); sodium hydroxide, sodium carbonate, and sodium tetraborate (applied to activate development); sodium sulfite and potassium metabisulfite (used as preservatives), potassium bromide and benztriazole (restrainers); acetic acid; sodium or ammonium thiosulfate (used to fix development); sodium bisulfite and potassium metabisulfite (employed as neutralizers); and potassium aluminum sulfate and potassium chromium sulfate (applied as hardeners). Chemicals used in the color photographic processes are: potassium ferricyanide and potassium bromide, ethylenediamine tetraacetic acid (EDTA), bleach, hexavalent chromium, and organic dyes.

This Work Plan recommends that soil and ground water samples collected at the Former Bell Trading Post property (using a Geoprobe® or comparable direct-push drilling method) be analyzed for the parameters outlined in Section 4.5.

1.0 INTRODUCTION

This document presents the Phase II Site Characterization Work Plan (Work Plan) for soil and ground water sampling and analysis at the Former Bell Trading Post Property (Site) located at 1503 Central Avenue, in Albuquerque, New Mexico. This document was prepared based on letter correspondence and discussions with the State of New Mexico Environment Department (NMED) and City of Albuquerque (COA) representatives. This Work Plan was prepared for the NMED Ground Water Quality Bureau's Voluntary Remediation Program (VRP) and follows the Duke Engineering and Services (DE&S) "Scope of Work and Cost Estimate" (SOW) submitted to NMED on March 30, 2001.

This Work Plan is not intended to cover all of the necessary health and safety processes and procedures that should be followed to carry out the activities described in the sections of this Work Plan. A Site-specific Health and Safety Plan (HSP) is included in Appendix A.

1.1 General Project Background

In a letter dated April 12, 2001, Ms. Christine Bynum, Program Manager of the NMED VRP, authorized DE&S to complete Subtasks 1, 2, and 3 of the DE&S proposed SOW dated April 5, 2001. Subtasks 1, 2, and 3 are defined as follows:

Subtask 1: Project coordination/background review, SOW and Cost Estimate preparation.

Subtask 2: Further investigation into past site uses and operating procedures.

Subtask 3: Work Plan and Cost Estimate for Phase II site characterization activities.

DE&S has developed this Work Plan (as outlined in Subtask 3 above) to perform Phase II site characterization based on the following activities:

- Completion of a historical Site use review and a series of interviews with individuals knowledgeable with the historical Site uses; and
- Several telephone conversations with Ms. Christine Bynum of the NMED.

This document is the deliverable associated with Subtask 3.

1.2 Site History

Prior to 1947, historical uses of the property were primarily residential. After 1947, historical property use was commercial/industrial. From 1947 until 1975, Bell Trading Post occupied the Site building and conducted commercial jewelry manufacturing. The Site is identified as vacant from 1976 until approximately 1981 or 1982. From approximately 1982 until 1984, Albuquerque Photo Lab occupied the Site building and performed commercial film development. Finally, from 1985 until 1992, Michelson Metals occupied the Site building, using the property as an office for commodity trading only (office use, non-industrial). Site property owner Mr. J.T. Michelson has stated that neither metal work nor jewelry production occurred at the Site after 1975 (Interviews with Mr. J. T. Michelson on April 18 and May 3, 2001).

1.3 Potential Contaminants of Concern

The potential contaminants of concern derive from the industrial processes associated with the jewelry manufacturing and photographic development previously conducted at the Site. These potential contaminants include but are not limited to solvents, cyanide, and heavy metals. The potential contaminants of concern and their possible origins are discussed in the following paragraphs.

- Based on limited background research of the jewelry manufacturing industry and current jewelry industry practices, the following chemicals are likely to be present at a jewelry manufacturing facility: sodium and/or potassium cyanide, hydrogen peroxide, sulfuric and boric acids, ammonia hydroxide, calcium sulfate, sulfured potash, potassium bifluoride (and potassium tetraborate), and heavy metals such as gold, silver, and copper.
- Chemicals used in the development of black and white photographic films are: silver halide (contained in emulsifiers); hydroquinone, metol, and phenidone (used as developing agents); sodium hydroxide, sodium carbonate, and sodium tetraborate (applied to activate development); sodium sulfite and potassium metabisulfite (used as preservatives), potassium bromide and benztriazole (restrainers); acetic acid; sodium or ammonium thiosulfate (used to fix development); sodium bisulfite and potassium metabisulfite (employed as neutralizers); and potassium aluminum sulfate and potassium chromium sulfate (applied as hardeners). Chemicals used in the color photographic processes are: potassium ferricyanide and potassium bromide, ethylenediamine tetraacetic acid (EDTA), bleach, hexavalent chromium, and organic dyes.

1.4 Other Environmental Issues of Concern

Although DE&S did not perform a Phase I Environmental Assessment at the Site, other environmental issues of concern were noted its review of the Phase I ESA by Keers Environmental (Keers 2000). The other environmental issues of concern identified were:

- The potential for the presence of lead-based paint based on the age of the Site improvements and the potential for the presence of lead in the drinking water from pipe dope and solder.
- The possible presence of asbestos-containing materials in the Site structures based on age of Site improvements. The interior materials include Thermal System Insulation (TSI) on an active hot water tank, sheet flooring, floor tile, mastic, and drywall.
- The potential for contaminants to be introduced onto the Site or transported from the Site to adjoining properties by surface water runoff. The Site and vicinity are located in a designated flood zone and could be environmentally impacted during a flood event.
- The possible presence of septic tanks that may have been active while the Site was in use for residential purposes. The possible presence of septic tanks is indicated by two rectangular depressions in the asphalt surface of the 309 15th Street property (as observed on Historic Sanborn Fire Insurance Maps during the development of the Keers Phase I ESA Report). Nitrate contamination of ground water has been extensively documented in the Albuquerque area.

- An active NMED leaking Underground Storage Tank (UST) site has been identified approximately one-eighth of a mile northwest of the site. The UST site is identified as The World Motel at 1721 Central Avenue NW (World Motel UST). The NMED Underground Storage Tank Bureau (USTB) has indicated that a release of gasoline impacted ground water upgradient of the Site. According to NMED USTB representative Norman Pricer, the ground water impact from this UST has been delineated and identified as limited in extent to the World Motel, and the associated contamination resulting from this leaking UST will not be considered a potential contaminate of concern.

1.5 NMED Requirements for Phase II Investigation

Ms. Christine Bynum, Program Manager of the NMED VRP, submitted a Site Phase II Task Assignment to DE&S in a letter dated March 16, 2001. This Work Plan covers Phase II Site Characterization activities in accordance with the contract between NMED and DE&S, with the NMED Task Assignment, and with the NMED recommendation for Phase II activities at the Site based on the following comments from Christine Bynum in a letter dated March 16, 2001:

- “The City of Albuquerque is contemplating the purchase of this property and potentially converting the building to affordable housing. To NMED knowledge, there is a Phase I that has been done on this property by the current owner and there has been some soil sampling performed. It is my understanding that all of the sampling performed was beneath the building, around drains and in the crawlspace. Additional sampling is necessary in exposed portions of the yard, especially since they are proposing to use the property for housing.”

1.6 Work Plan Overview

This Work Plan includes a description of the following activities:

- Soil sample collection using a Geoprobe® and laboratory analysis of the soil samples;
- Ground Water sample collection and laboratory analysis of ground water samples from selected Geoprobe® soil boring locations;
- Final report completion.

DE&S will interact with NMED VRP and COA representatives to coordinate the schedule for any and all of the field work pertaining to this Work Plan.

1.7 Prior Reports Review/Historical Site Uses

The COA is considering this piece of property for condemnation. COA is proposing plans to redevelop the Site into residential multi-family housing. The most recent Phase I Environmental Site Assessment for the Bell Trading Post property, “Phase I Environmental Site Assessment, Bell Trading Post and Adjacent Parcels,” was completed by Keers Environmental, Inc. (Keers) in December 2000 (Keers 2000). DE&S has reviewed this report and finds the following important conclusions:

- An active UST site has been identified approximately one-eighth of a mile northwest of the site. The UST site is identified as The World Motel at 1721 Central Avenue NW (World Motel UST). The NMED USTB has indicated that a release of gasoline has impacted ground water upgradient of the Site.
- Because of the age of the Site structure, the potential for construction materials containing either lead or asbestos or both should be considered.
- The Site is located in a designated flood zone and could be environmentally impacted during a major flood event.

A Phase II ESA, "Limited Subsurface Investigation at 1503 Central Avenue, Albuquerque, New Mexico," was completed by Keers in April 1994 (Keers 1994). DE&S has reviewed this report and notes the following findings and conclusions:

- Ten surficial soil samples were collected in a crawl space beneath the building. The samples were collected at suspected highly contaminated areas under drains, sumps, and piping. The samples were analyzed for volatile organic compounds (VOCs) and halogenated hydrocarbons using laboratory method SW-846 8010, total cyanide using laboratory method SW-846 9010, and RCRA metals using laboratory method SW-846 AA.
- Results from the limited subsurface investigation revealed that silver, chromium, and lead were present in several surficial soil samples collected from within the crawl space under the building. Two of the subsurface soil samples collected contained compounds with concentrations exceeding the Toxicity Characteristic Leaching Procedure (TCLP) regulatory limit. One subsurface soil sample contained 134 parts per million (ppm) lead, and the other subsurface soil sample contained 174 ppm chromium and 1,670 ppm lead. The elevated concentrations of these compounds prompted further field investigation and the collection of soil samples from a depth of 5-feet below the soil surface at each of the two locations where elevated concentrations were detected in the initial investigation. These deeper subsurface soil samples were analyzed using TCLP methods for the specific metals originally detected. Silver concentrations of <0.010 ppm were reported in samples from below locations where initial samples reported elevated silver concentrations. The sample collected below the location where chromium and lead had been detected contained 0.047 ppm chromium and 0.890 ppm lead. Keers indicated that the results from the 5-feet deep samples were well below the United States Environmental Protection Agency (EPA) regulatory limits and that additional testing was not recommended at that time (Keers 1994).

1.8 Interviews

DE&S representatives interviewed the following individuals for information pertaining to historic site uses of the Former Bell Trading Post property.

Mr. J.T. Michelson is the current owner of the Site. DE&S representatives contacted Mr. Michelson by telephone on April 18 and May 3, 2001. Mr. Michelson provided the following information:

- Mr. Michelson was involved with the day-to-day operations of the jewelry manufacturing business previously located at the Site.

- Bell Trading Post used sulfurated potash, also known as “Liver of Sulfur,” to oxidize or clean silver and copper metal jewelry. The liver of sulfur was stored in 10 to 20-pound bags within the facility. The liver of sulfur is mixed with water to form a solution to clean copper and silver.
- Bell Trading Post casting operations used gypsum (plaster of Paris) molds. The molds were disposed of at the COA dump after use. Wax castings were not used at Bell Trading Post.
- Bell Trading Post polished silver jewelry with a mild soap solution. Mr. Michelson did not know the type of soap used or the amount stored at the facility.
- Bell Trading Post performed soldering operations. Soldering operations utilize fluxes that contain acids. During soldering operations, acids may become very fluid when heated. Mr. Michelson could not recall the types of fluxes that were used at Bell Trading Post, nor could he specify the types of acids they may have contained. Mr. Michelson did recall that silver solder was the primary solder employed at Bell Trading Post.
- Mr. Michelson stated that the area above the crawl space or sub-basement was used for storage of finished jewelry and a shipment loading dock area.
- Bell Trading Post employed 200 workers. The facility consisted of a tool room, soldering room, parts storage, stamping area, and administrative offices. The second story of the facility was used as a casting area.
- Mr. Michelson stated that Bell Trading Post ceased jewelry manufacturing operations in 1976.
- According to Mr. Michelson, a photographic development shop was located in the facility for five years in the early 1980s. Mr. Michelson could recall neither the name of the business that leased the property nor its owner’s name. Mr. Michelson was also unable to say how much of the building and which sections were occupied by the photographic development business.

Mr. Norman Pricer, Field Representative of the NMED USTB was interviewed by telephone on May 10, 2001 to discuss the status of the World Motel UST. The World Motel UST is considered to be hydraulically upgradient relative to the Site (to the west of the Site). According to the most recent information available on the USTB web site, the World Motel UST has impacted ground water and discharged free product. Mr. Pricer stated the following:

- The petroleum compound released at the facility was kerosene/diesel fuel;
- A soil vapor extraction (SVE) remediation system was previously in place at the World Motel UST; however, ground water monitoring is the only activity currently taking place at the World Motel UST;
- The World Motel UST ground water plume has been delineated, with no apparent easterly migration.

A former Albuquerque Photo Lab, Inc., employee, Mr. Steven Donahue, a photographer who worked only in the photo shop at the facility, was interviewed by telephone on May 8, 2001. Mr. Donahue stated the following:

- Albuquerque Photo Lab, Inc., operated for four to five years in the early 1980s and employed 8 to 10 people.
- Albuquerque Photo Lab, Inc. performed color photo processing, black and white photo processing, off-set printing, and blue print production. Two large printing presses were in use at the Site facility.
- Mr. Donahue was uncertain about all chemicals used by Albuquerque Photo Lab, Inc., at the Site facility building; however, he stated that ammonia, inks, solvents, and silver halide were in use at the facility, and also that the silver (metal) recycling was conducted.
- According to Mr. Donahue, Albuquerque Photo Lab, Inc. went out of business in the mid-1980s.

1.9 Recognized Environmental Conditions

Recommendations from the Keers Report (Keers 1994) include:

- Periodic review of the most current UST information to determine and assess the extent of soil and ground water contamination, if any, that may be caused by the upgradient active World Motel UST and possibly impact the Site. A site that may be unaffected by contamination at the time an assessment is performed may later become contaminated through a natural phenomenon (such as ground water flow) or through human intervention.
- Comprehensive Site asbestos and lead-based paint surveys prior to any planned demolition or renovation activities following OSHA and EPA regulations for demolition and renovation practices.
- Determination of Site flood potential through review of the most current Bernalillo County Flood Control District flood information.
- Evaluation of the two rectangular depressions in the asphalt to confirm the presence of abandoned septic tanks and to investigate potential soil contamination.
- Depending upon planned Site use and occupancy, possible further evaluation of the subsurface soil beneath the Site structure.

2.0 SITE SETTING

2.1 Geologic and Hydrogeologic Setting

The Site is located in the southern-central portion of the Albuquerque Basin. This Basin is one of the largest of the southerly trending series of grabens that form the Rio Grande Drainage Basin. The Rio Grande Drainage Basin was formed in response to the Rio Grande Rift (Thorn et al. 1993). The Rio Grande Rift is a northerly to southerly trending, downdropped crustal extension that originates in Colorado and extends for more than 600 miles, crossing New Mexico to south of the Mexico/Texas border.

The Albuquerque Basin is filled with up to 10,000-feet of clastic sediments. These sedimentary deposits are of two types: 1) sediment that has filled the subsiding trough, and 2) floodplain deposits, terraces, dunes, alluvial fans and cones, spring deposits, caliche blankets, landslides, and some pediments. The latter group of deposits represent processes of erosion and deposition that may have prevailed throughout subsidence and filling of the basin (Kelley 1977). The Santa Fe Formation sediments fill the majority of the basin.

The Tertiary and Quaternary Santa Fe Formation is composed of unconsolidated to loosely consolidated gravels, sands, silts, and clays. The thickness of this unit ranges from 2,400-feet on the basin margins to 14,000-feet along the axis of the basin. In the vicinity of the Site, the thickness of this formation is approximately 4,700-feet. The Santa Fe Group is overlain by Quaternary sediments, which have a similar facies distribution. These post-Santa Fe deposits are alluvial fan and floodplain deposits and are up to 200-feet thick (Thorn et al. 1993).

The Santa Fe Group and post-Santa Fe deposits are the principal water bearing units in the vicinity of the Site and are hydraulically connected (USACE 1979; Thorn et al. 1993). However, the Albuquerque Basin aquifer is anisotropic laterally and vertically due to spatial variations in the lithology of these two water-bearing units (Chamberlin et al. 1992). Clay layers 12- to 15-feet thick are commonly observed in the alluvium of the Albuquerque Basin; these clay layers restrict vertical movement of water and may locally limit hydraulic interconnection between the shallow Quaternary aquifer and the Santa Fe Group aquifer (Thorn et al. 1993). As a result of spatial variations in lithology, variation in the hydraulic transmissivity of the Albuquerque aquifer is extremely large, from less than 10 square feet (ft²)/day to 80,000 ft²/day (Thorn et al. 1993). The hydraulic conductivity of the upper part of the Santa Fe Group varies also, but is estimated to be approximately 20 ft/day, average in the vicinity of the Site (Thorn et al., 1993).

Over time, population growth and the resulting increased water pumpage and use have considerably changed the water table configuration in the Albuquerque area. Ground water flow in the vicinity of the Site prior to large-scale ground water development is thought to have been to the southwest, and this condition existed at least into the mid- to late-1930s (Thorn et al. 1993). Ground water elevation contours representing 1960–1961 conditions in the Albuquerque area show a continued general southwesterly flow direction on the eastern side of the Rio Grande; however, a cone of depression is evident in the general area of the Site (Bjorklund 1961). The cone of depression resulted primarily from pumping of the Main Plant well field, previously located in the downtown Albuquerque area. The Main Plant wells were drilled

between 1920 and 1948 and consisted of more than 23 wells; the Main Plant well field is now completely abandoned.

Ground water beneath the Site currently flows in an easterly direction. City-wide ground water contours from 1992 and simulated 1994 hydraulic head levels reflect a large cone of depression developing on the eastern side of Albuquerque as a result of ground water withdrawal (Kernodle et al. 1995). Based on the Kernodle study, this cone of depression appears to have influenced the ground water flow direction beneath the Site.

2.2 Adjoining Property Usage and Potential Receptors

The area surrounding the Site is developed with urban commercial buildings. Roma Avenue and a vacant, paved automobile parking lot located beyond the Avenue bound the Site to the north. An apartment building and dentist office bordered by a gravel alley are located east of the Site. Central Avenue acts as the Site's southern boundary; vacant lots line the Site's entire southern perimeter across Central Avenue. An apartment building and an office building are located west of the Site, beyond Laguna Boulevard.

Potential human receptors in the vicinity of the Site include area workers, pedestrians, and trespassers on the Site. On-site workers are not considered potential receptors as the Site building is not currently occupied by any reported employees. Potential exposure of environmental workers (field consultants, field technicians, environmental samplers, remediation contractors, etc.) is addressed in the HSP that accompanies this Work Plan.

2.3 Site Location

The Site consists of approximately 2.5 acres near Old Town Albuquerque and is bounded to the south by Central Avenue, on the north and northeast by Roma Avenue, on the northwest by Fifteenth Street, to the east by an apartment complex and a vacant business, and to the west by Laguna Boulevard. The Site is located in the COA, Bernalillo County, New Mexico. Currently, there is one large (approximately 30,000 square feet) vacant building on the Site (1503 Central Avenue).

A site location map is included as Figure 1.

3.0 PAST OPERATING PROCEDURES

Subtask 2 of the approved Task assignment work was to determine what processes and chemical uses were employed at the Site commercial building for the manufacturing of jewelry and also in photographic development. The identification of these processes and chemical uses enabled DE&S to prepare a more efficient Site-specific environmental sampling Work Plan.

Subtask 2 included researching chemical usage and disposal techniques employed in the jewelry and photographic industries generally and, if possible, at the Site specifically. DE&S contacted the current owner of the Site, Mr. J. T. Michelson. Mr. Michelson was involved with the day-to-day operations of the jewelry manufacturing business at the Site. Mr. Michelson was contacted and questioned as to what chemicals were used at the facility, what typical maintenance procedures were followed, and what disposal methods were typically used. Mr. Michelson was questioned as to whether or not he could recall any catastrophic chemical releases at the Site. In addition, Mr. Michelson was asked, but he was unable to remember, who had leased the building and operated the photographic development business. Mr. Michelson's comments are included hereafter:

- Bell Trading Post used sulfurated potash, also known as "Liver of Sulfur," to oxidize or clean silver and copper metal jewelry. The liver of sulfur was stored in 10 to 20-pound bags within the facility. The liver of sulfur is mixed with water to form a solution to clean copper and silver.
- Bell Trading Post casting operations used gypsum (plaster of Paris) molds. The molds were disposed of at the COA dump after use. Wax castings were not used at Bell Trading Post.
- Bell Trading Post polished silver jewelry with a mild soap solution. Mr. Michelson did not know the type of soap used or the amount stored at the facility.
- Bell Trading Post performed soldering operations. Soldering operations utilize fluxes that contain acids. During soldering operations, acids may become very fluid when heated. Mr. Michelson could not recall the types of fluxes that were used at Bell Trading Post, nor could he specify the types of acids they may have contained. Mr. Michelson did recall that silver solder was the primary solder employed at Bell Trading Post.
- Mr. Michelson stated that the area above the crawl space or sub-basement was used for storage of finished jewelry and a shipment loading dock area.
- Bell Trading Post employed 200 workers. The facility consisted of a tool room, soldering room, parts storage, stamping area, and administrative offices. The second story of the facility was used as a casting area.
- Mr. Michelson stated that Bell Trading Post ceased jewelry manufacturing operations in 1976.
- According to Mr. Michelson, a photographic development shop was located in the facility for five years in the early 1980s. Mr. Michelson could recall neither the name of the business that leased the property nor its owner's name. Mr. Michelson was also unable to say how

much of the building and which parts were occupied by the photographic development business.

Additional research into chemical uses at jewelry manufacturing and photographic development operations were accomplished by reviewing relative journals, documents, books, and other printed media. In addition, interviews of industry representatives associated with this property were conducted. Review of documents related to case studies or remediation at these types of industries was undertaken. Sections 3.1 and 3.2 of this SOW detail information collected concerning the jewelry manufacturing and photographic development industries.

3.1 Jewelry Manufacturing

DE&S personnel conducted local library reference material and Internet research to obtain information pertaining to the jewelry manufacturing industry. The general processes employed at a jewelry manufacturing facility are outlined hereafter.

Soldering: The Bell Trading Post employed soldering processes at the facility during its years of operation. A flux is applied to the metal to be soldered. Heating the solder and the metal causes them to form a strong bond. Mr. Michelson stated that the Bell Trading Post used silver solder. No records of the silver solder used by the Bell Trading Post were made available to DE&S; however, DE&S obtained and reviewed material safety data sheets (MSDS) for currently manufactured silver solder and silver solder fluxes. According to these documents, silver solders normally consist of ammonium chloride, antimony, copper, rosin, silver, tin, urea, and zinc chloride. Silver solder fluxes consist of boric acid, potassium bifluoride, and potassium tetraborate. Silver soldering with silver solder flux produces fumes of boron oxide and fluoride. A hydrofluoric acid may be produced if the materials soldered are rinsed with water shortly after soldering. In turn, the acid may cause metals present in the soldered materials to go into solution. If Bell Trading Post silver soldering practices included water rinsing, these acid and metal mixtures may have resulted. Rinsed from the floor of the facility into one of the sumps, the mixture may have threatened or possibly impacted localized ground water either through a sump leak or through a leak in the piping associated with the sump.

Casting: Mr. Michelson stated that castings were created at the Bell Trading Post with gypsum (plaster of Paris). This material was stored as a solid (powder) in 50-pound bags and mixed with tap water when designated for use. Plaster of Paris chemically consists of hemi-hydrated calcium sulfate and is created when the mineral gypsum is heated and then hydrated with water. Further addition of water causes plaster of Paris to become very hard, and this hardened version is used industrially to form several types of casts and molds. Plaster of Paris is environmentally hazardous as a nuisance dust that can be harmful under recurring inhalation exposure. Mr. Michelson has stated that all plaster of Paris materials have been removed from the Site and have been disposed of at the COA dump. Based on these statements, DE&S finds that no current potential exposure exists in the ambient air in the Site facility building. If the plaster of Paris is found to be present, DE&S recommends removal of the plaster of Paris from the building as soon as is feasible. Calcium sulfate is not very soluble in water and can contribute to water hardness. Localized ground water hardness may exist in the area of the Site facility building if aqueous mixtures of plaster of Paris leaked through drains into the underlying ground water table.

Bombing: It is not known if the practice referred to in the jewelry industry as “bombing” was employed at the Bell Trading Post facility. “Bombing,” also called “striping,” is a technique used for brightening and removing tarnish from soldered metals. In bombing, a solution of sodium cyanide, heated almost to the boiling point, is poured over a piece of jewelry placed in a container and covered with a hydrogen peroxide solution. The solution formed by the bombing process contains sodium cyanide and a small amount of hydrogen peroxide. Decomposition of the hydrogen peroxide in the solution causes vigorous evolution of oxygen and induces the removal of the oxide layer. The process also causes the formation of metal cyanide complex ions and the dissolution of metal oxides. After use, bombing solutions may contain silver, copper, and other metal ions from the constituents of the jewelry cleaned. These metals can be recovered by electrolysis of the solution. The bombing process and the use of similar cleaning techniques employing sodium cyanide are extremely common in the jewelry manufacturing industry. Although Bell Trading Post is not known to have used the bombing process described here, the likelihood that it employed sodium cyanide in a similar technique is very strong.

Applying Luster - According to Mr. Michelson, jewelry at the Bell Trading Post was oxidized with sulfurated potash (also known as “liver of sulfur”). Liver of sulfur is a very effective oxidizer of sterling of silver but is sometimes difficult to apply. Jewelry to be oxidized is placed in a solution of liver of sulfur and water. The solution is heated and the jewelry is oxidized according to design specifications (normally until the metal has a blue-black appearance). Liver of sulfur as a solid produces a nuisance dust and is a particulate breathing inhalation environmental hazard. Common decomposition products of the liver of sulfur oxidation process are hydrogen sulfide and oxides of sulfur. Based on the Keers Environmental Phase I ESA report and a DE&S representative visit to the Bell Trading Post property building, DE&S believes that all remaining quantities of liver of sulfur have been removed from the Site facility building.

Polishing - Polishing wheels commonly used in the jewelry industry will cause silica dust. It is not known if polishing wheels were in use at the Site facility during jewelry manufacturing operations. Polishing wheels will cause an inhalation environmental hazard when in use. Since the facility ceased operation several years ago, the risk associated with polishing wheels is considered minimal.

3.1.1 Chemical Storage

According to Mr. Michelson, liver of sulfur, plaster of Paris, fluxes, silver solder, and several of the chemicals used in the soldering, casting, bombing, luster, and polishing processes were used and stored at the Site facility building. Mr. Michelson neither knew what quantities were used or stored nor could he identify storage areas within the facility building. Mr. Michelson is able to recall only the materials listed as present at the Site facility. However, research of current jewelry manufacturing practices indicates that, the following chemicals are likely to be present at jewelry manufacturing facilities and therefore may be or have been present at the Site:

Sodium and/or potassium cyanide

Hydrogen peroxide

Sulfuric and boric acids

Ammonia hydroxide

Calcium sulfate

Sulfurated potash

Potassium bifluoride, and potassium tetraborate

Heavy metals (gold, silver, copper, etc.)

As part of this Work Plan environmental media at the Site (soil and ground water) will be sampled and analyzed for the presence of these common jewelry-manufacturing chemicals. The concentrations of these chemicals identified in soil and ground water will be compared with applicable soil and/or ground water NMED or EPA standards where available.

3.2 Photograph Development

According to Mr. Michelson, a photographic development business operated in the Bell Trading Post building for approximately five years in the early 1980s. The Keers Phase I ESA report (Keers 2000) indicates that the 1982 Albuquerque City Directory lists a business called "Albuquerque Photo Lab" at the Site address. A former Albuquerque Photo Lab employee, Mr. Steven Donahue, was interviewed by telephone on May 8, 2001. According to Mr. Donahue, Albuquerque Photo Lab, Inc. operated for four to five years in the early 1980's. Mr. Donahue stated that the business employed approximately 8 to 10 people. The Albuquerque Photo Lab, Inc. performed color photographic processing, black and white photographic processing, offset printing, and blue print production. Mr. Donahue was a photographer who worked only in the facility's photo shop. He stated knowledge of ammonia, inks, solvents, and silver halide use by Albuquerque Photo Lab, Inc., at the Site facility, and also stated that the business recycled silver and operated two large printing presses on site. However, Mr. Donahue's knowledge of chemical use at the Site by Albuquerque Photo Lab, Inc., was in general limited. According to Mr. Donahue, Albuquerque Photo Lab, Inc. went out of business in the mid-1980s. Mr. Phil Herkenhoff is the former owner of Albuquerque Photo Lab, Inc. and the current owner and operator of Herkenhoff Enterprises, Inc. DE&S has attempted to but as of the writing of this Work Plan, have been unable to contact Mr. Herkenhoff

Specific examples of photographic development processes that took place at the Site facility building are not available. The following sections describe general examples of common photographic processes. Processes undertaken at the Site during its use as a photographic development facility are likely to have been the same as or similar to the processes discussed hereafter.

In general, photographic processing consists of producing a visible black and white or color image by applying a series of chemical solutions and wash waters to a silver halide-sensitized material. Current photographic development practices employ over 20 different processes with

variations in solution chemistry and treatment sequence. As stated in the preceding paragraph, specific processes used at the Site facility building are not known.

Process wastewater from photographic processing commonly contains large amounts of silver, cyanide, and chromium. Silver results from the processing of silver-halide-sensitized photographic materials. Cyanide and chromium result from bleaches that are commonly used in photographic processing. Cadmium, the result of additional development practices, is also found in photographic processing wastewater. The observed presence of cadmium in photographic wastewater is statistically smaller than that of silver, cyanide, or chromium, but still regarded as a significant quantity.

Ion exchange or reverse osmosis systems are commonly used for recovery of silver for after-fix wash wastewater. Mr. Donahue has stated that silver was recycled at the Site facility building. He also stated that ferrous sulfate treatment was used to reduce the amount of cyanide in photographic process wastewater.

3.2.1. Black and White Photograph Development

Black and white film or paper consists of a base material or substrate that is coated with a light-sensitive emulsion. Silver halide crystals are spread evenly throughout the emulsion. When the emulsion is exposed to light, electrons are ejected from the halide ions. Crystal imperfections or other chemicals trap these "free electrons." The electrons attract positively charged free silver ions in crystal lattice-forming clusters of metallic silver at the trap sites. These clusters of silver form a latent image of the original light exposure pattern. During processing, the developer solution causes additional silver to be attached at the cluster site to the image (chemical amplification). The film image then undergoes further chemical treatment to stabilize the image and to remove excess chemicals. Chemicals and their uses in the development of black and white photographs are:

<u>Chemical</u>	<u>Use</u>
Silver halide	Emulsion
Hydroquinone and metol or phenidone	Developing agent
Sodium hydroxide or sodium carbonate or borax (sodium tetraborate)	Activator
Sodium sulfite or potassium metabisulfite	Preservative
Potassium bromide or benztriazole	Restrainer
Acetic acid	Short Stop
Sodium or ammonium thiosulfate	Fixer

Sodium bisulfite or potassium
metabisulfite

Neutralizer

Potassium aluminum sulfate or
potassium chromium sulfate

Hardener

3.2.2 Color Photograph Development

Unmodified silver halide emulsions are sensitive to only a limited range of wavelengths, including the blue-violet region of the visible spectrum, ultraviolet, and shorter wavelengths. However, the inclusion of certain organic dyes in the emulsion can extend sensitivity to longer wavelengths through the visible spectrum into the infrared and can increase emulsion sensitivity to a particular region of the visible spectrum. Color films have three separate light-sensitive emulsion layers. After inclusion of the appropriate dyes, these layers record images of the blue light components, the green light components, and the red light components on first, second, and third layers respectively.

The commonly used color photographic materials are color negative films; color reversal films; color print films; and color print papers. The three basic color development processes are negative, reversal with couplers in the emulsion, and reversal with coupler in the developers.

Chemicals and their uses in the development of color photographs are:

<u>Chemical</u>	<u>Use</u>
Silver halide	Emulsion
Diethylpara-phenylene diamine salt	Developer
Hydroxylamine hydrochloride	Fog restrainer
Acetic acid and/or sodium acetate	Developer removal agent
Ferricyanide bleach	Film bleaching agent
Formalin and sodium carbonate solution	Hardener

4.0 SAMPLING AND ANALYSIS ACTIVITIES

4.1 Purpose of Investigation

The purpose of this Phase II investigation is to acquire enough information to characterize the Site for evaluation under NMED VRP performance standards. Soil samples will be collected to assess soil conditions in areas of the Site with exposed soil (or areas now covered with asphalt/concrete believed to have been formerly exposed during building operations). Ground water samples will be collected from selected Geoprobe® soil borings (completed along the Site boundaries) to assess any impacts that the site may have had on local ground water quality.

4.2 Sampling and Analysis

The sampling and analysis section of this Work Plan includes the following activities:

- Soil sample collection and analysis;
- Ground water sample collection and analysis.

4.2.1 Soil Boring Installation and Continuous Soil Sampling

DE&S will advance 12 Geoprobe® soil borings in the following locations at the Bell Trading Post property (Figure 2). These locations were selected from a sampling grid of all open areas (not covered by the Site building):

- Two (2) near the northeastern corner of the Site (adjacent to the gravel alley);
- One (1) near the northwestern corner of the Site (adjacent to the intersection of Roma Avenue and Laguna Boulevard);
- One (1) near the northern end of the adjacent apartment building (adjacent to the eastern side of the Site building);
- Five (5) in the southwestern corner area of the Site (adjacent to the western side of the Site building); and
- Three (3) along the southern side of the Site building (adjacent to the north side of Central Avenue NW).

Prior to initiating soil boring, DE&S will contact New Mexico One-Call Systems, Inc., and all local utility companies to determine the locations of underground utilities.

In order to minimize the cost for disposal and decontamination of soil cuttings, DE&S recommends that direct-push methods (i.e. Geoprobe®) be used for the soil borings completed as part of this assessment. A subcontractor will be utilized to conduct the exploratory boring advancement and sampling program. The subcontractor will be under the direct supervision of

the DE&S representative and will conduct the subsurface sampling program using a truck-mounted Geoprobe® soil investigation unit. The Geoprobe® utilizes a rotary hammer mounted on a hydraulic ram that, in conjunction with the weight of the vehicle, advances a 2-inch, threaded, hollow-probed steel tube into the subsurface. Soil and ground water samples can be extracted at discrete intervals using various down-hole tools in conjunction with the Geoprobe®.

If the Geoprobe® is not capable of penetrating the subsurface materials, then a drilling rig utilizing a hollow-stem auger drilling and sampling method will be used to complete the project. Use of a hollow-stem auger drilling rig would indicate a change in the Scope of Work and associated costs. NMED will be notified immediately if hollow-stem auger drilling is required to discuss project options and to determine how to proceed. It should be noted that Geoprobe® drilling practices have previously been successful in close proximity of the Bell Trading Post property.

The DE&S Standard Operating Procedures (SOP) for the direct-push soil boring advancement and subsurface soil sampling are included in Appendix B of this SOW.

Soil samples will be collected continuously from the ground surface to the terminal depth of each boring (ranging from approximately 4- to 25-feet). All soil borings will be completed to an approximate depth of 4-feet below ground surface (bgs), with the exception of soil borings SB-01, SB-03, SB-04, and SB-12, which will be completed to depths of approximately 25-feet bgs (suspected local ground water contact). The DE&S geologist will produce a lithologic log of each soil boring. The soil cuttings will be described in accordance with Unified Soil Classification System (USCS). Descriptions of the soil cuttings will include lithologic type, minerals present, color, particle size range, particle angularity, density, plasticity, particle sorting, moisture content, and structure.

Each soil boring will be abandoned by pouring bentonite pellets or chips into the vacant soil boring, then hydrating the bentonite using potable water.

Each soil sample collected will be screened in the field for VOCs using a photoionization detector (PID) via heated headspace technique. The NMED USTB SOP for heated headspace reading collection is included in Appendix C of this Work Plan. The PID will be equipped with an 11.7 ionization potential electron volt lamp that provides the sensitivity necessary to identify VOCs suspected to be present in site soils. The PID provides screening of ionizable organic compound concentrations in air and gives a direct readout in ppm. The PID determines the concentration of total ionizable VOCs, but does not differentiate between specific compounds. The operational range of the PID is 0 to 2,000 ppm, with a minimum instrument detection of 0.1 ppm. Soil samples collected for PID headspace screening will be placed in a laboratory pre-cleaned glass jars, and the jar openings will be sealed with aluminum foil. The soil samples will be allowed to reach ambient temperature either by placement in the sun and/or a warm-water bath. After the soil sample has been at ambient air temperature for approximately 10 minutes, the tip of the PID will be inserted into the jar by piercing the aluminum foil, and the reading returned will be recorded in the field notebook or appropriate field form.

In each of the 4-feet deep soil borings, a soil sample will be collected from the 0 to 2-feet bgs interval and the 2- to 4-feet bgs interval. All of the shallow soil samples (the 0 to 2-feet bgs

interval) collected from each soil boring will be submitted for laboratory analysis. If metals are detected in any of these soil samples (0 to 2-feet bgs intervals) above normal background levels, then the associated deeper soil sample (the 2- to 4-feet interval) from the same soil boring will be analyzed by the laboratory in order to assess the potential for leaching at the Site.

Each of the deeper soil borings (SB-01, SB-03, SB-04, and SB-12) may also be sampled at the 0 to 2-feet bgs and 2- to 4-feet bgs intervals (if the soil boring is located in an area where additional coverage of surface soils is needed; in areas where the results may be useful for comparison as background soil samples; and/or if the soil borings are located in areas of exposed soil where potential releases might have occurred). In addition, any soil samples exhibiting a significant PID reading, soil staining, and/or odor will be considered for laboratory analysis.

In addition, a maximum of three of the soil samples will be submitted for analysis of soil geotechnical properties (parameters to be used in a potential site-specific risk analysis). These samples will be selected based upon lithology type. The geotechnical soil samples will only be analyzed if Site soil samples submitted for analytical analysis indicate the presence of metals or other contaminants of concern. Each of the three selected geotechnical soil samples will be submitted for the following soil geotechnical parameters: dry bulk density (ASTM Method D2937-94), porosity (ASTM Method D854), volumetric water content/moisture content (ASTM Method D2216-92), fractional organic carbon content in soil (ASTM Method 2974), and sieve analysis (or soil gradation analysis).

Each soil sample selected for laboratory analysis will be placed in glass jar with a Teflon™-lined lid, labeled with the location, time, and date of collection, sampler's name, and required analyses. The soil samples selected for laboratory analysis will be immediately placed in a cooler filled with ice for delivery to the contract laboratory. Standard chain-of-custody procedures will be adhered to throughout the investigation.

All drilling equipment used for boring advancement will be steam-cleaned prior to drilling to remove oils, chemicals, and soil. All soil boring equipment will also be steam cleaned between locations to eliminate the possibility of cross contamination between two borings. Sampling tools will be decontaminated between each use, using established protocols. Equipment decontamination procedures are outlined in Appendix D of this Work Plan.

4.2.2 Ground Water Sample Collection

Four of the Geoprobe® soil borings (SB-01, SB-03, SB-04, and SB-12) will be completed to a depth of approximately 25-feet bgs (suspected local ground water contact). Ground water samples will be collected at these locations. Two of these ground water samples will be collected near the northeastern corner of the Site, one ground water sample will be collected from the southeastern corner of the Site, and one ground water sample will be collected from near the northwestern corner of the Site.

The locations of the proposed ground water sample collection points are shown in Figure 2. These locations were chosen based on their proximity to the Site property corners and current local ground water flow direction (to the east, southeast).

Each ground water sample will be collected from each Geoprobe® soil boring by constructing a mini-well. The mini-well will be constructed of 1.0 inch-diameter schedule 40 PVC casing. The lower 5-feet of the casing will be slotted (0.01 inch). Polyethylene tubing will then be placed inside the casing and ground water will be removed from the Geoprobe® soil boring using a peristaltic pump. The mini-well casing and polyethylene tubing will be discarded after use by the drilling subcontractor.

All ground water samples collected for laboratory analysis will be analyzed for those parameters outlined in Section 4.5 of this Work Plan.

4.3 Quality Assurance

QA/QC samples for the soil samples will consist of field duplicates and decontaminated equipment blanks. A duplicate is obtained by collecting two samples at one sampling location and labeling one sample as the primary sample name and the other as a field duplicate. The time of collection should be left off the sample container label and chain-of-custody (COC) so that the analytical laboratory does not have an indication of which sample is the field duplicate. In addition, one equipment blank per day will be collected. The equipment blanks will be analyzed in the same manner as the primary samples.

QA/QC ground water samples will be collected at a minimum frequency of 5 % (or 1 for every 20 samples) and will include duplicate samples, field blanks, and equipment rinsate blanks. There will be one trip blank per cooler shipment, if samples are collected for VOA analyses. The field blank sample will be collected by pouring deionized water through the air into a sample container at the Site. The rinsate sample will be collected after decontamination of the equipment by pumping deionized water through the sampling pump or sampling device. Trip blanks will be provided in the sample cooler and accompany the samples from the Site to the contract laboratory. Trip blank samples will only be analyzed if unusual or unexpected laboratory results are identified in the primary samples.

The selected laboratory's QA/QC Plan will be followed, which should require matrix spike and method blank samples to be run at frequencies dictated by laboratory certification requirements. The analytical laboratory will have State- and EPA-certifications for conducting the specific analytical methods.

4.4 Data Evaluation

DE&S will complete a final report describing the work completed at the Site, including the following:

- Any additional information concerning Site conditions discovered during completion of the Phase II Investigation;
- A summary of the historical background of the Site;
- A complete description of the technical approach and field methods used during field activities;

- A complete description of the results of the field investigation tasks;
- All field forms and field notes taken during the investigation;
- A risk assessment for potential exposures to contaminated soil and ground water at the Site, using the Tier I approach specified in the "Technical Background Document for Development of Soil Screening Guidelines" (NMED 2000). This is equivalent to a Method 2 assessment specified in 20 New Mexico Administrative Code (NMAC) 6.3 Subpart I Section 110 of the VRP Regulations;
- DE&S conclusions and recommendations.

4.5 Laboratory Analysis

Table 1 outlines the laboratory analysis for the soil samples and ground water samples collected from the Geoprobe® soil borings. All soil and ground water samples will be analyzed for these parameters.

**Table 1. Soil and Ground Water Sample Analysis
Bell Trading Post Property Work Plan**

Chemicals Potentially Used at the Site	Sample Matrix	Analysis	Number of Samples*	EPA Method Number(s)
Sodium cyanide, sodium carbonate	Ground Water	Sodium	5	200.7
Sodium cyanide, potassium cyanide, potassium ferricyanide	Soil/Ground Water	Cyanide	13 soil/5 gw	335.4
Potassium cyanide, potassium tetraborate, potassium bromide, potassium aluminum sulfate, potassium chromium sulfate, potassium ferricyanide	Ground Water	Potassium	5	200.7
Calcium sulfate	Ground Water	Calcium	5	200.7
Potassium bifluoride	Ground Water	Fluoride	5	340.1
Sodium carbonate	Ground Water	Carbonate	5	300.0
Sulfuric acid, calcium sulfate, potassium aluminum sulfate, potassium chromium sulfate	Ground Water	Sulfate	5	300.0
Ammonia hydroxide	Ground Water	Ammonia	5	350.2
Metals	Soil/Ground Water	NWQCC Metals**	13 soil/5 gw	6010
Zinc	Soil/Ground Water	Zinc	13 soil/5 gw	6010
Mercury	Soil/Ground Water	Mercury	13 soil/5 gw	7470/7471A
Sulfuric Acid	Soil/Ground Water	Acid/Base (pH)	13 soil/5gw	150.1 gw 9045 soil
Nitrates	Ground Water	Nitrate - Nitrite	5	353.2
Hydrogen peroxide	Ground Water	Dissolved Oxygen	5	Field Meter

Table 1. Soil and Ground Water Sample Analysis (Continued)
Bell Trading Post Property Work Plan

Chemicals Potentially Used at the Site	Sample Matrix	Analysis	Number of Samples*	EPA Method Number(s)
N/A	soil	Fractional Organic Carbon	4	2974
N/A	soil	Sieve Analysis	4	D422-63
N/A	soil	Specific Gravity	4	D2932-94
N/A	soil	Moisture Content	4	D2216-92
N/A	soil	Bulk Density	4	D2937-94
N/A	soil	Dry Sieve Analysis	4	D422-63

Notes:

* - This is a minimum number of samples for analyses. Additional samples may be collected based upon field screening criteria.

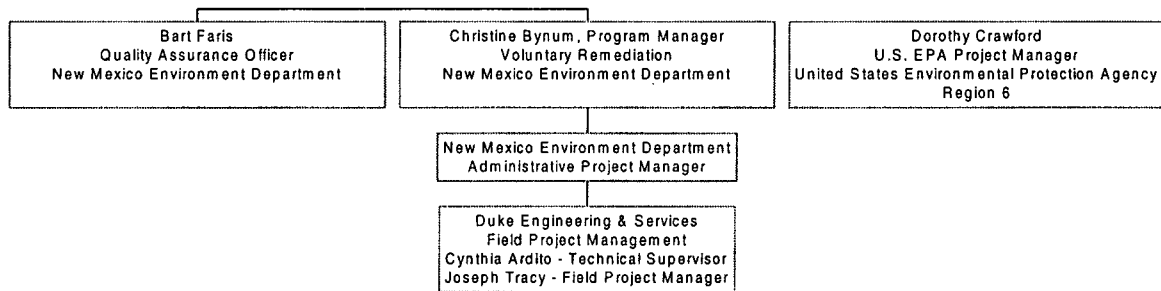
** - NMWQCC Metal analyte list includes: Arsenic, Barium, Cadmium, Chromium, Lead, Mercury (total), Selenium, Silver, Copper, Iron, Manganese, and Zinc.

4.6 Investigation Derived Waste

A plan to address the issue of investigation derived waste (IDW) produced during the implementation of this Work Plan is included in Appendix E.

4.7 Project Organizational Chart

The project organizational chart for the Site is outlined below.



5.0 DELIVERABLES AND SCHEDULE FOR COMPLETION OF WORK

The only deliverable for this project is a final report describing the technical approach, the field sampling/investigation, and results of sample analytical analysis. Included with the final report will be conclusions and recommendations for additional work (if determined warranted).

- | | |
|---|--------------------------|
| • Approval and Finalization of Work Plan | Week 0 - Week 2 |
| • NMED Development of QAPP | Week 2 - Week 4 |
| • Complete Field Work | Week 4 - Week 6 |
| • Draft Final Report | Week 6 - Week 8 |
| • NMED Review and Comment Period | Week 8 - Week 10 |
| • Submittal of Final Report | Week 10 - Week 12 |

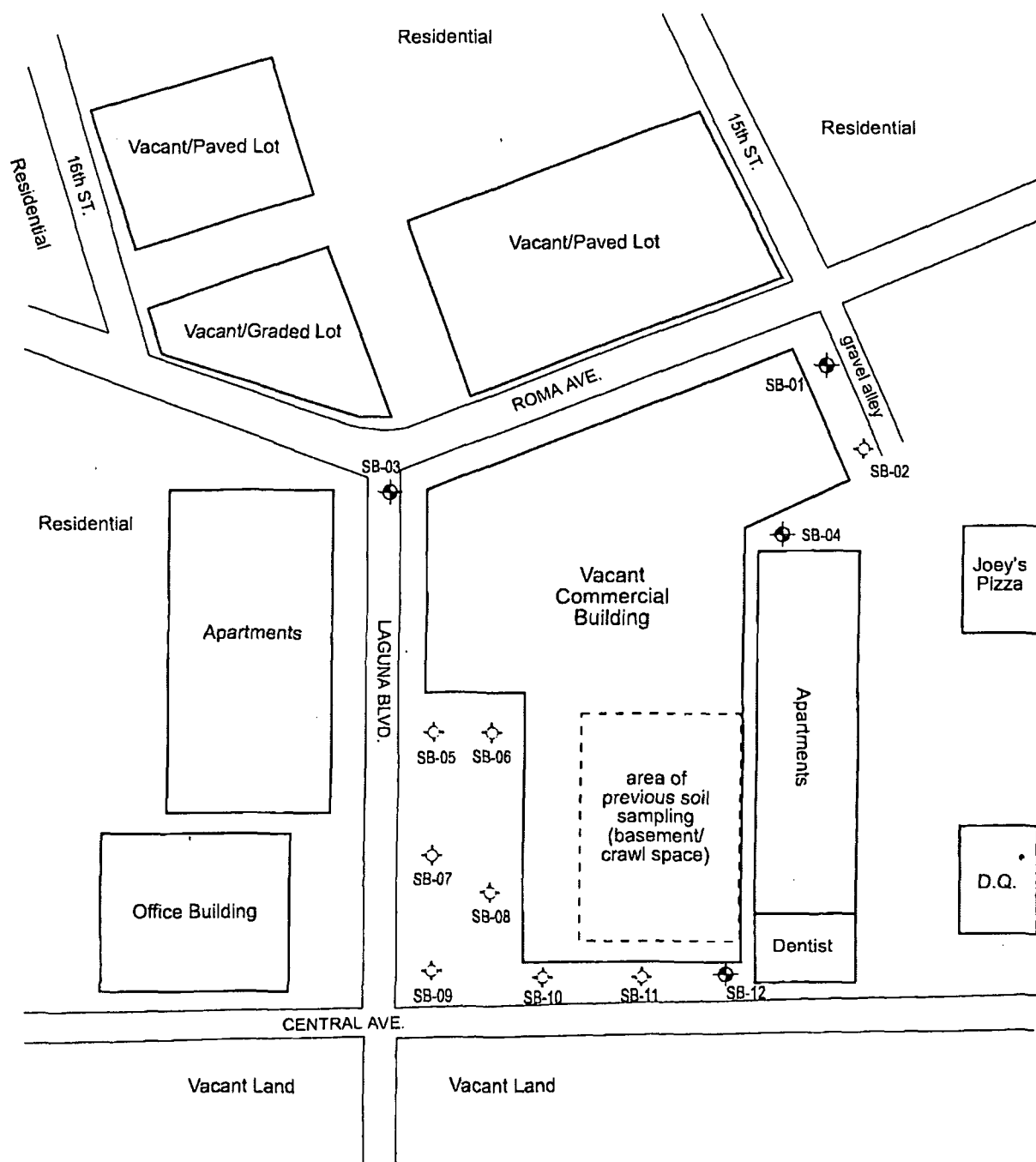
6.0 DISCUSSION OF HOW PROPOSED ACTIVITIES COMPLY WITH THE VOLUNTARY REMEDIATION PERFORMANCE STANDARD

The VRP allows for the completion of a risk assessment to address potential risks associated with site contaminants and to determine when compliance with VRP Performance standard is met (20 NMAC 6.3, Subpart I, Section 110B) (NMED, 1999a). A risk assessment will address human exposures to Site contaminants in soil and ground water resulting from previous Site use. The risk assessment will be conducted by comparing historical and current soil and ground water concentrations as an initial step. When background concentrations are exceeded, the average soil and individual ground water concentrations shall be compared to New Mexico Soil Screening Guidance (NMSSG) and New Mexico Water Quality Control Commission (WQCC) standards, respectively (where applicable). If comparison results indicate noncompliance with the NMSSG and WQCC standards, then a site-specific risk assessment and targeted removal actions may be undertaken as a later stage of work, as approved by NMED.

7.0 REFERENCES

- Bjorklund, L. J., and B. W. Maxwell, 1961. *Availability of Ground Water in the Albuquerque Area, Bernalillo and Sandoval Counties, New Mexico*, New Mexico State Engineer Technical Report 21.
- Chamberlin et al. (R. M. Chamberlin, J. M. Gillentine, C. S. Haase, J. W. Hawley, R. P. Lozinsky, and P. S. Mozley), 1992. *Hydrogeologic Framework of the Northern Albuquerque Basin*, Open-File Report 387, New Mexico Bureau of Mines and Mineral Resources, New Mexico Institute of Mining and Technology, Socorro, New Mexico, September 1992.
- Duke Engineering & Services, 2001. "Scope of Work and Cost Proposal Task 1, Further Investigation into Chemical Use and Disposal associated with the Bell Trading Post Property, 1503 Central Avenue, Albuquerque, New Mexico," March 30, 2001.
- Keers Environmental, 2000. "Phase I Environmental Site Assessment, Bell Trading Post & Adjacent Parcels, 1503 Central Avenue NW, Albuquerque, New Mexico," December 18, 2000.
- Keers Technical Services, 1994. "Limited Subsurface Investigation at 1503 Central Avenue, NW, Albuquerque, New Mexico," April 26, 1994.
- Kelley, V. C., 1977. "Geology of Albuquerque Basin, New Mexico, Memoir 33," New Mexico Bureau of Mines & Mineral Resources, a Division of New Mexico Institute of Mining & Technology, Socorro, New Mexico.
- Kernodle, J. M., D. P. McAda, and C. R. Thorn, , 1995. "Simulation of Ground-Water Flow in the Albuquerque Basin, Central New Mexico, 1901–1994, with Projections to 2020," U.S. Geological Survey Water-Resources Investigations Report 94-4251.
- Interview with Mr. J. T. Michelson on April 18 and May 3, 2001.
- Interview with Mr. Steven Donahue on May 8, 2001.
- Interview with Mr. Norman Pricer on May 10, 2001.
- New Mexico Environment Department, 1999. *New Mexico Voluntary Remediation Regulations (20 NMAC 6.3)*. Santa Fe, New Mexico, July 15, 1999.
- New Mexico Environment Department; 2000; *Technical Background Document for Development of Soil Screening Levels*; completed by NMED personnel staff November 6, 2000.
- Thorn, C. R., D. P. McAda, and J. M. Kernodle, 1993. *Geohydrologic Framework and Hydrologic Conditions in the Albuquerque Basin, Central NM*, U.S. Geological Survey, Water-Resources Investigation Report 93-4149.
- United States Environmental Protection Agency, Effluent Guidelines Division, 1981. "Guidance Document for the Control of Water Pollution in the Photographic Processing Industry" dated April 1981.

FIGURES

**LEGEND**

- ◇ Soil Sampling Location (8 total)
- ⊕ Soil and Groundwater Sampling Location (4 total)



NOT TO SCALE

File: Bell-sampling.fh8

Site Sketch and Sampling Location Map – Bell Trading Post Property

Figure 2

Duke Engineering & Services
 a Duke Energy Company

Albuquerque, New Mexico

APPENDIX A
HEALTH AND SAFETY PLAN

APPENDIX B

DIRECT PUSH TECHNIQUES STANDARD OPERATING PROCEDURES

Direct Push Techniques

Direct-push drilling is often selected as the drilling method of choice for easy to penetrate unconsolidated materials where wells two inches in diameter or larger will not be installed. Most direct-push drilling systems allow for both continuous sampling and discrete-interval sampling. Direct-push borings can easily be converted to monitor wells typically 1/2- to 1-inch in diameter. Some direct-push drilling systems allow for the installation of 2-inch monitor wells yet may consequently leave insufficient annular space for the placement of sand pack and grout. Prepacked screens should be considered as a means of insuring an adequate filter pack in small diameter borings.

Objectives

Direct-push borings may be drilled in uncontaminated areas for background information, or in areas of known contamination. The objectives of the direct-push borings are:

- determination of the character of the soil and geologic media to a specified total depth;
- collection of soil samples for chemical analyses;
- determination of the vertical extent of contamination where encountered; and
- investigation of locations previously not drilled.

Drilling Equipment

Drilling equipment, such as direct-push probes, tubes, drive shoes, displacement points, shovels, sampling tools, and other necessary equipment, is generally supplied by the driller. Direct-push borings are typically 2 to 4 inches in diameter depending on the equipment used, the type of subsurface encountered, and whether or not small-diameter wells will be installed. Further information on equipment and procedures for monitor-well installation can be found under *Standard Operating Procedures, Monitor-Well Installation*.

Sampling Equipment

Before beginning each soil boring, the following equipment will be assembled:

- sample shuttles;
- chemical sample containers with laboratory-supplied preservatives, if required;
- geotechnical sample containers, if applicable;
- sample labels;
- sampling tools (i.e., sample liners and caps and split-barrel samplers);
- personal protective equipment;
- decontamination equipment;
- waterproof pens;
- stainless steel pocket knife or spatula;
- clean cutting surface;

- custody seals;
- boring logs;
- sample control logs;
- chain-of-custody forms; and
- field logbook.

Sample-Collection Procedures — Chemical Analyses

Soil borings will be sampled continuously to the specified total depth, unless otherwise instructed. Samples will be collected using stainless-steel tubes, transparent plastic tubes, or a split-barrel sampler. Typically the drive casing and/or sample barrel are 2-feet, 3-feet, 5-feet, or 10-feet in length.

A synthetic sample catcher is affixed to the bottom of the sample barrel when loose sediment may otherwise fall out of the sample barrel.

If refusal of the sampling device is encountered, attempts to advance the boring without the encumbrance of the sampling device can be attempted so as to advance to a depth that permits sampling. Otherwise, it may be advisable to begin a new boring adjacent to the boring of refusal in an attempt to avoid the earlier impediment.

During direct-push drilling, several types of information should be recorded, either on the boring log or in the field logbook. Information that will be recorded includes the following:

- name and/or job number and location of job,
- names of crew,
- type and make of drilling machine,
- weather conditions,
- surface conditions,
- date and time of start and finish of boring,
- boring number and location (station and coordinates, if available and applicable),
- surface elevation (if available),
- method of advancing and cleaning the boring,
- method of keeping the boring open (if any),
- depth to top of ground water and drilling depth at the time of a noted loss of drilling fluid,
- sample depth and percent recovery,
- size of casing, and depth of cased portion of boring,
- equipment and method of driving sampler,
- sampler type and dimensions (note use of liners), and
- remarks (if any).

Once the sample has been collected and brought to the surface, the following procedures should be followed for collection of samples for chemical analyses.

- Samples collected with stainless steel or transparent plastic tubes or with stainless steel split barrel samplers will be field extruded onto a split stainless-steel tube or a split PVC tube for

screening (if necessary) and description. Depending on the scope of the sampling effort, the sample may receive pass-over field screening or headspace analysis field screening with a PID or FID. Pass-over field screening is performed fairly quickly by making an incision down the length of the sample, passing the PID or FID probe along the incision while partially covering the incision with a hand, and noting the readings. The typical protocol for conducting heated headspace analysis is as follows:

1. Fill a 0.5 liter/16 ounce or larger clean glass jar half full of soil sample. Plastic bags or other non-glass containers are not acceptable.
 2. Seal top of jar with clean aluminum foil and lid ring or equivalent.
 3. Ensure sample is at 15° to 25°C or approximately 60°F to 80°F. A warm water bath should be used if necessary to raise sample temperature to acceptable range. Samples are to be protected from direct sunlight in order to prevent photodestruction of the volatiles.
 4. Aromatic hydrocarbon vapor concentrations should be allowed to develop in the headspace of the sample jar for 5 to 10 minutes. During the initial stages of headspace development, the sample is to be shaken vigorously for one minute.
 5. Immediately pierce the foil seal with the probe of either a Photoionization Detector (PID), a Flame Ionization Detector (FID), or colorimetric tube, and record the highest (peak) measurement. The instrument should be able to accurately detect total aromatic hydrocarbons (TAH) between 0 and 1000 parts per million (ppm).
- Soil samples will be split open and the sample will undergo screening and description.
 - Soil type will be described according to the Unified Soils Classification System (ASTM D-2488). Appropriate information will be recorded on the boring log.
 - Visual inspection, pass-over field screening, and/or PID headspace analysis of samples will serve as the criteria used in the field to screen samples for volatile organic contamination.
 - Upon completion of field screening and soil description, part or all of each sample will be placed in a clean, labeled sample container, and capped securely.
 - Samples to be analyzed for volatile organics should be disturbed as little as possible, and the interval to be sampled should be containerized first, even before the soil has been described, to prevent loss of volatile components.

If methanol extraction is required for samples to be analyzed for volatile organics, the analytical laboratory should be instructed to supply appropriate sample bottles ready and pre-weighed, containing purge-and-trap grade methanol. Disposable syringes to be used for collecting the soil samples should also be supplied by the laboratory. The following procedure should then be used to collect the soil samples:

1. Fill the syringe with 10 - 15 cm² of soil, avoiding pebbles or other large particles.

2. Unscrew the cap on the sample bottle and quickly push the sample into the bottle with the syringe plunger, being careful not to get soil particles on the rim of the bottle. If the methanol is supplied in a separate vial, pour it into the sample bottle at this point, being careful not to spill any of the methanol. Quickly replace the cap and tighten securely.
 3. Gently agitate the sample so the soil is immersed in the methanol. Excessive agitation may cause undo volatilization.
- Field replicates are obtained by splitting the sample interval into two separate samples, which are then containerized and analyzed. Field duplicates are obtained by homogenizing the sample in a stainless-steel or glass container before splitting it into two samples for containerization and analysis.
 - Sample labels will include the following information:
 - project name and/or number;
 - field sample number;
 - depth interval, if applicable;
 - initials of collector;
 - date and time of collection; and
 - sample type and preservative (if any).
 - Label information for replicate and duplicate samples requires only project name and/or number, field sample number, and sample type and preservatives (if any).
 - Samples are then placed in the sample shuttle and, if required, stored and transported at <4 C (39 F), using frozen ice packs or double-bagged ice.
 - Sample information will be recorded in the field logbook and on the sample control log as soon as possible after sample collection, in accordance with procedures set forth in the Quality Assurance Project Plan.
 - A chain-of-custody form will be completed and placed in the sample shuttle for shipment to the laboratory.
 - A custody seal will be placed across the sample shuttle lid so that the sample shuttle cannot be opened without breaking the custody seal. Custody seals will contain the following information:
 - collector's signature or initials; and
 - date of shipment.
 - Samples will be shipped to the laboratory for analysis in a timely manner that facilitates the ability of the laboratory to meet all minimum holding-time requirements for degradable constituents.

- A decontamination station will be set up near the borehole location, where sampling equipment will be decontaminated between collection of each sample, as described in *Standard Operating Procedure, Decontamination*.

Boring Grouting

Grout is used to backfill the boring at the completion of drilling. Retraction grouting (i.e. grouting as the drive casing is retracted) is preferred in contaminated subsurface conditions since. For grouting shallow borings, cement-bentonite slurry or bentonite pellets are poured into the drive casing as the casing is retracted or directly into the open boring if it is able to stay open and not undergo cave in. In deep borings, retraction grouting is accomplished by pumping grout to the bottom of the boring through tubing placed inside the drive casing.

The grout used should approximate a mixture of Type I Portland cement (95-97%) and powdered bentonite (3-5%). Typically each sack of grout is mixed with 7 gallons of potable water. Grout is used to seal the formation and reduce the potential for vertical migration of surface or subsurface water.

When possible, the grouted borings will be inspected at least 24 hours after the grout has been allowed to shrink and settle. If settling has occurred, additional bentonite-cement grout will be added to bring the grout level to ground surface. All cuttings, fluids, and other unused material generated from the drilling and monitor-well development process will be segregated and placed immediately in 55-gallon drums or other appropriate containers, labeled with boring number, date, and project number, and stored on site pending analysis. Equipment used for grouting purposes (tremie pipe, pumps, grout-mixing containers, etc.) will require cleaning with potable water.

APPENDIX C

**NEW MEXICO ENVIRONMENT DEPARTMENT UNDERGROUND
STORAGE TANK BUREAU HEATED HEADSPACE STANDARD
OPERATING PROCEDURE**

Headspace Analysis

The NMED UST Bureau has issued the following guidance on Headspace analysis.

Equipment needed for soil screening includes clean 0.5 to 1 liter or 16-ounce jars, aluminum foil, and a FID, PID, detector tubes, or other acceptable field instrument. If the temperature is below 60° Fahrenheit or 15° Celsius, a thermometer and water bath will also be needed. The container for the water bath must be large enough to hold the sample jar, heat source, and deionized water. It is also acceptable to warm up the sample using heated air from the interior of a vehicle. The use of a portable gas chromatograph is optional. Use best judgement in choosing a field instrument. Factors to consider include, but are not limited to, age of the UST system, soil characteristics, and extent of contaminant degradation. Instruments for field screening should be calibrated in the field and in good working order. Follow the manufacturer's instructions for calibrating the field instrument.

The steps for the heated headspace method are:

- (1) Fill a 0.5 liter/16 ounce or larger clean glass jar half full of soil sample. Plastic bags or other non-glass containers are not acceptable.
- (2) Seal top of jar with clean aluminum foil and lid ring or equivalent.
- (3) Ensure sample is at 15°C to 25°C or approximately 60°F to 80°F. A warm water bath or heated air from the interior of a vehicle should be used if necessary to raise sample temperature to the acceptable range. Samples are to be protected from direct sunlight in order to prevent photo-destruction of the volatiles.
- (4) Aromatic hydrocarbon vapor concentrations should be allowed to develop in the headspace of the sample jar for 5 to 10 minutes. During the initial stages of headspace development, the sample is to be shaken vigorously for one minute.
- (5) Immediately pierce the foil seal with the probe of either a Flame Ionization Detector (FID), a Photoionization Detector (PID) or colorimetric tubes, and record the highest (peak) measurement. The instrument should be able to accurately detect total aromatic hydrocarbons (TAH) between 0 and 1000 parts per million (ppm).

APPENDIX D

EQUIPMENT DECONTAMINATION METHODS
STANDARD OPERATING PROCEDURE

Equipment Decontamination

Specific equipment decontamination procedures are described in the following paragraphs. Types of equipment decontamination that may occur at a given site include the following:

- sampling-equipment decontamination between individual sampling locations to ensure that representative samples are collected;
- drilling-equipment decontamination at the completion of each boring to ensure that boreholes are not cross contaminated; and
- tractor, forklift, backhoe and/or other heavy equipment decontamination to ensure that contamination is contained during site activities.

Sampling equipment will be decontaminated before leaving the Contamination Reduction Zone. Some or all of the following steps will be used to decontaminate this equipment:

- hand-held equipment showing surficial-solid contamination will be placed in a wash tub (or other applicable container) and the contaminated material will be physically removed using scrapers, brushes, or etc. Equipment will then be transferred to the designated container for the detergent wash. Contaminated solids will be drummed or otherwise containerized for disposal when necessary;
- the wash procedure will be followed by a double rinse. Equipment will typically be rinsed first in a wash tub with potable water followed by a spray rinse of distilled water;
- all wash and rinse solutions will be drummed for disposal when necessary;
- equipment that may be damaged by water, such as instruments, will be carefully cleaned with a sponge and detergent water when necessary. Care will be taken to prevent equipment damage;
- solvents such as methanol may be used on an as-needed basis to remove tar or other organics from equipment;
- clean equipment will be air dried if possible or wiped dry with a clean material if needed for immediate reuse; and
- clean equipment will be stored and transported such that it is protected until used again for sampling. Plastic bags are commonly used to help protect many clean equipment items.

When practical, a sufficient quantity of clean, decontaminated sampling equipment will typically be available so that each sample can be taken with a separate sampling tool, and decontamination will be performed on all equipment at the end of the sampling effort, rather than between each sample.

Drilling-equipment decontamination will be conducted in the Contamination Reduction Zone. Drilling auger flights or direct-push probes will be dismantled and transported to the decontamination area between each boring. The following steps will be used to decontaminate the auger flights or direct-push probes:

- gross soil, dirt, or waste contamination on the drilling augers will be removed at the drilling site. Contamination will be removed using blade scrapers or by other physical methods. Material removed from the augers or probes will be placed in drums or other dedicated containers;
- augers or probes will be carried to the decontamination pad. Augers or probes will typically be placed on a rack in the decontamination area to ensure that water from the decontamination process does not reintroduce contamination to the cleaned equipment; and
- a heated, high-pressure wash operating at a temperature of approximately 212° F and discharging 5 gallons per minute will typically be used to remove the contamination from the outside of each flight. Strongly adhered waste may require additional scrubbing using a wire or bristle brush. The inside of each auger or probe will also be cleaned with a pressure washer or steam cleaner and, if needed, scrubbed with a wire or bristle brush.

Any vehicle used to carry the auger flights or push probes will also receive a heated, high-pressure wash in all areas where the auger flights or push probes come into contact with the vehicle. Once the cleaned augers or push probes are placed into the transport vehicle, additional care will be given to ensure that the augers or probes remain clean by wrapping them in plastic when necessary.

All waste generated during decontamination activities will be contained using drums or other appropriate containers. Waste containers will be labeled properly and stored at the site temporarily pending proper disposal.

Dorothy Crawford

10/03/01 08:14 AM

To: chris_bynum@nmenv.state.nm.us

cc: MRandall@cabq.gov, Roger Hancock/R6/USEPA/US@EPA, Mike Cockrell/R6/USEPA/US@EPA

Subject: Re: Bell Trading Post QAPP



Chris, I looked at the draft QAPP and Work Plan for the Former Bell Trading Post site located at 1503 Central Ave NW, Albuquerque. I am glad you can provide this free assessment service to the city before they acquire the site (planned reuse residential/housing).

I have no comments on the QAPP but would like to see Figure 2 (you typically have to fax these to me because they do not come with the electronic work plan file). If nothing about Figure 2 raises a concern, I will be ready to sign the QAPP cover sheet (approve the QAPP). In other words, fax both Figure 2 and cover sheet.

Also, am I correct in assuming the planned assessment work is a Targeted Brownfields Assessment done with funds we provided under the state VCP/VRP and TBA Cooperative Agreement and not an assessment done under the Brownfields Assessment Pilot. Reason I ask, is we track the TBAs here and I did not want to count it unless I should.

Dorothy Crawford (6SF-PB)
crawford.dorothy@epa.gov
chris_bynum <chris_bynum@nmenv.state.nm.us>



chris_bynum
<chris_bynum@nmenv.state.nm.us>

10/01/01 06:05 PM

To: Dorothy Crawford/R6/USEPA/US@EPA

cc: Meg Randall <MRandall@cabq.gov>

Subject: Bell Trading Post QAPP

Dorothy--

Attached is the QAPP for the Bell Trading Post. We have a Geoprobe driller tentatively scheduled to begin on October 8, so we would like to begin then if we can (not to rush you). I am sending the Work Plan in a separate e-mail message. Thanks for reviewing this for us!